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ABSTRACT

As a result of the cooperative efforts in articulation by secondary/postsecondary instructor teams, six packages representing the occupational areas of child care, culinary arts, electronics, health occupations, power mechanics, and industrial welding were developed. Each package contains the following three components: a series of job titles sharing the same skill base (job family cluster); an analysis of tasks associated with one or more of the job titles; and the measurable instructional objectives used to conduct training in the job skills. Results of the articulation showed that some low level entry jobs are trained for exclusively at the secondary level and that some high level jobs are trained for exclusively at the postsecondary level, and that a third group (referred to as "articulated") may be taught at either level with the only variable being the depth and emphasis of training reflected by the instructional objectives. (BM)

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ED152964

THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

WORKSHOP PRODUCTS

The attached packages are products of the cooperative efforts in articulation by secondary/post-secondary instructor teams representing six occupational areas. Each team was required to assemble three basic components for successful completion of the package. Briefly, these components may be described as follows:

1. a series of job titles sharing the same skill base (referred to as the "job family cluster");
2. an analysis of tasks associated with one or more of the job titles; and
3. measurable instructional objectives used to conduct training in the job skills.

Prior to the team effort, each instructor was provided with an instructional package describing how to create the requisite components. Thus, when the instructors came together to coordinate their efforts at a workshop held at Keene State College in June, 1977, each had materials of uniform content and format.

Results of articulation show that some low level entry jobs are trained for exclusively at the secondary level; and that some high level jobs are trained for exclusively at the post-secondary level. A third group, which we call "articulated," may be taught at either level - with the only variable being the depth and emphasis of training reflected by the instructional objectives.

It was determined that the best means of validating the workshop products was to organize a craft advisory panel, consisting of individuals recommended by the participating instructors. Each panel member represented the occupational field in question. The panel met in August, 1977, to review and present recommendations and comments about both the package and the process of articulation. For details of the entire project and the craft advisory panel's review, please refer to the final report. Copies are available from the Office of Director of Professional Development, Vocational-Technical Division, New Hampshire State Department of Education.

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THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

VOCATIONAL SKILL AREA: CHILD CARE

PARTICIPANTS: NANCY CHASE, SALEM HIGH SCHOOL, SALEM, N.H.

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WORKSHOP DATES: JUNE 27, 1977 - JULY 1, 1977
KEENE STATE COLLEGE, KEENE, N.H.

Activities supported by the N.H. State Department of Education, Vocational-Technical Division under the authority of Section 553 of the Education Professions Development Act.

SECTION I

EXPLANATION OF EMPHASIS AND DEPTH DIFFERENCES FOR SECONDARY AND POST-SECONDARY PROGRAMS IN CHILD CARE

On the secondary level, curriculum areas are introduced on an individual basis. Each one is explored for types of materials, how to use the materials, what values the area has for the child, how to motivate the child in that area and carrying out at least one activity.

At the post-secondary level, curriculum is dealt with as a whole, with students developing entire programs based on their observations of the children. These programs are implemented and evaluated by the students.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Observation 1st yr.	The student will be able to write an observation and interpretation of the four ways to observe and give three reasons for the importance of observing children. Also, apply and assess the observation technique(s).	T	S-PS
	Explain four ways to observe	I	S-PS
	Name five reasons for observing children.	I	S-PS
	Define objectivity and interpretation.	I	S-PS
	Correct a paragraph as to observation quality vs. interpretation.	I	S
	List and explain at least four guidelines to follow when observing.	I	S-PS
	Apply and assess observation material.	I	PS
Child Care Worker 1st yr.	According to our policy, the student will be able to list and explain ten responsibilities of a child care aide, at least eight ways that a student may assist a teacher in given areas, identify the mandatory rules of our ore-school, identify six personal characteristics of a child care aide and define what teamwork and ethics would be for a child care aide.	T	S
	List and explain ten responsibilities of a child care worker.	I	S
	Identify the mandatory rules of a preschool.	I	S
	List eight ways in which a child care worker may assist the teacher in given areas.	I	S
	Identify six personal characteristics of a child care worker.	I	S
	Define teamwork and ethics for a child care worker.	I	S
Preschool Environment-Curriculum Development 1st yr.	The student will be able to set up a preschool environment, specifying learning stations and how they will function, materials, indoor environment requirements and how this program will affect the child's self-image.	T	S-PS
	Identify 12 curriculum areas and explain the importance of each.	I	S-PS
	Name three reasons why the preschool is arranged the way it is.	I	S
	List five opportunities that the child care center provides for the child.	I	S-PS
	Define learning center and list four factors that lead to its success.	I	S

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Preschool Environment-Curriculum Development (cont'd.)	Name and explain seven facilities in the preschool classroom.	I	S
	Design a learning center and explain your arrangement.	I	S-PS
	Lead curriculum planning sessions with staff	I	PS
	Record observations of curriculum implementation.	I	PS
Child Guidance-Discipline 1st yr.	Given a discipline problem, the student will be able to handle the situation in a positive way, using appropriate plans and guidelines and setting limits, demonstrating the ability to choose the best method of discipline for the particular problem and identify his/her philosophy of child guidance as well as apply this knowledge.	T	S-PS
	Name and explain ten guidelines when disciplining.	I	S-PS
	Name and explain six purposes of discipline.	I	S-PS
	The student will be able to explain how to handle specific disciplinary problems.	I	S-PS
	Explain the following types of discipline and give examples: Physical, Ignoring, Deprival, Expected Behavior and Behavior Modification.	I	S
	Identify the difference between discipline and punishment.	I	S-PS
	Explain the importance of setting limts when disciplining.	I	S-PS
	Explain the importance of planning in relation to discipline.	I	S-PS
	Write philosophy of child guidance.	I	PS
	Apply knowledge of child development for preschoolers to be distributed to staff.	I	PS
Basic Needs 1st yr.	The student will be able to identify at least six basic needs of preschool children, how these needs will promote a child's self-image and will be able to plan and do at least one activity with a child that meets a specific need.	T	S
	Name and explain six basic needs of children.	I	S-PS
	Relate self-image to basic needs of children.	I	S
	Identify an activity that satisfies each of the six basic needs	I	S

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Basic Needs (cont'd.)	Perform an activity that promotes each of the six basic needs.	I	S
Characteristics of the 4-6 year old child 1st yr.	The student will be able to list and describe the four areas of development and recognize behaviors in each area.	T	S-PS
	Name and briefly explain the four areas of development.	I	S-PS
	Recognize characteristic behavior of each area.	I	S-PS
Child and Family 1st yr.	The student will be able to list and explain the stages of the family life cycle as outlined in the Texas Tech Child Care Aide and give 25 major influences of the family life on a child's development.	T	S
	Identify 25 familial influences on children.	I	S-PS
	Identify and explain the stages of a family cycle.	I	S
Child's Play 1st yr.	The student will be able to name at least 25 opportunities that play provides a child and the value play has as a vehicle for learning. Explain the unoccupied, solitary, onlooker, parallel, associative and cooperative types of play, name five ways to destroy a child's play and give at least five guidelines for an adult to follow when supervising children's play.	T	S-PS
	Name 25 opportunities that play provides for a child.	I	S-PS
	Identify five ways of destroying play.	I	S
	Identify five guidelines to follow when observ ing children.	I	S
	Explain the following types of play: unoccupied, solitary, onlooker, parallel, associative and cooperative.	I	S-PS
	Describe the value of play as a learning vehicle.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Child's Play Materials 1st yr.	The student will be able to name at least eight guidelines to follow when choosing children's play materials, relate play materials to age and development of a child, create play materials for the age group 4-6 and work with children using play materials.	T	S-PS
	Name and explain at least eight guidelines to follow when choosing children's play materials.	I	S
	Relate play materials to age and development of a child.	I	S-PS
	Create play materials for the age group 4-6 years by using the guidelines.	I	S-PS
	Carry out at least one to six activities using play materials.	I	S-PS
	Evaluate the activities performed.	I	PS
Nutritional Needs 1st yr.	According to accepted health standards, the student will be able to identify all nutritional needs of preschoolers, state six characteristics that a 3-6 year old prefers in foods, name ten ways to introduce foolds to young children, describe at least three ways that a child's emotional state affects his eating habits, make up one activity that promotes good nutrition with preschoolers and plan and carry out or assist the teacher at snack time.	T	S-PS
	Identify nutritional needs of preschoolers.	I	S-PS
	State six characteristics that a 3-6 year old prefers in foods.	I	S
	Name ten ways to introduce foods to young children.	I	S
	Describe how emotions relate to eating habits.	I	S
	Perform yourself or assist teacher at snack time.	I	S-PS
	Make up an activity that promotes good nutrition with preschoolers.	I	S-PS
Clothing 1st yr.	The student will be able to choose an appropriate wardrobe for a preschool child, explaining several ways that attitude and construction are involved in the selection.	T	S
	Name ten guidelines when picking out children's clothing.	I	S
	Explain several ways that attitudes affect clothes selection.	I	S
	Evaluate children's clothing according to a checklist.	I	S

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Fear 1st yr.	The student will be able to name the major fears of a preschool age child and give an appropriate suggestion as to how to deal with each fear in a positive way.	T	S-PS
	Name ten fears of preschoolers.	I	S-PS
	Explain how you would help deal with each of the ten fears.	I	S-PS
Health	According to accepted health standards, the student will be able to identify and explain eight guidelines for good health, list five common illnesses, their symptoms and remedies and perform an activity that promotes good health habits with preschoolers.	T	S-PS
	Identify and explain guidelines for good health.	I	S
	Recognize at least five common children's illnesses, their symptoms and remedies.	I	S-PS
	Perform an activity that promotes good health habits in preschoolers.	I	S-PS
Safety 1st yr.	According to federal and state regulations, the student will be able to outline safety precautions to be taken in a preschool classroom, what steps to follow when an accident occurs and be able to do at least one activity that teaches good safety habits to a child.	T	S-PS
	Name five guidelines to follow when an accident occurs.	I	S-PS
	Recognize safety hazards in a preschool and how they could be corrected.	I	S-PS
	Carry out an activity that promotes safety with preschoolers.	I	S-PS
Sex Stereotyping 1st yr.	The student will be able to recognize and list ten instances of sex stereotyping which occur with young children in our society.	T	S-PS
	Recognize and list at least 10 instances of sex stereotyping which occur with young children in our society.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Career 1st yr.	The student will be able to list requirements and qualifications for at least five child care fields and be able to explain at least three sources available to a student to learn about careers.	T	S-PS
	Make yourself familiar with career resources in the Resource Center	I	S
	Name and explain five fields dealing with child care.	I	S-PS
Child Abuse 1st yr.	The student will be able to list several common reasons why child abuse occurs, the major signs of an abused child and will be able to identify in writing what to do and who to contact in a suspected child abuse case.	T	S-PS
	Recognize signs of abused children.	I	S-PS
	Identify resources that deal with child abuse problems.	I	S-PS
	Become familiar with procedures to follow in a suspected child abuse case.	I	S-PS
	Identify common reasons for child abuse.	I	S-PS
Art 2nd yr.	The student will be able to name 25 kinds of art materials to be used in a preschool classroom and ten values of art in a preschool curriculum, write a paragraph on how creativity is a part of the art curriculum, name five ways that preschoolers can be motivated to do art work and plan and perform 1-6 art activities with the children and the evaluate the activities performed.	T	S-PS
	Name at least 25 types of art materials to be used in a preschool classroom.	I	S
	Name and explain at least 10 values of art and its place in a preschool curriculum.	I	S-PS
	Write a paragraph on how creativity is a part of the art curriculum.	I	S-PS
	Name five motivating techniques used in prompting art activity in preschool.	I	S-PS
	Write up and perform 1-6 art activities with preschoolers.	I	S-PS
	Evaluate the activities performed.	I	PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
ield Trips 2nd yr.	Given a list of appropriate field trip sites, the student will be able to plan an appropriate field trip on paper, including at least two activities before and two follow-up activities, transportation, chaperones, permission slips and any special details that need to be attended to. The student will also be able to give five positive reasons for taking fieldtrips with preschoolers. The student will also lead one field trip.	T	S-PS
	Name at least five values for taking fieldtrips.	I	S-PS
	Plan on paper a field trip (See teacher for fieldtrip site book and assist the teacher on a field trip.	I	S
	Plan previous and follow-up activities with the preschoolers for a specific fieldtrip.	I	S-PS
	Lead a fieldtrip with the preschoolers.	I	S-PS
her Centers 2nd yr.	The student will be able to name seven different types of child care programs, explaining how five of the programs function and plan his/her own child care program, including physical plan, equipment, daily schedule, goals and objectives, type of child to be cared for, fund-raising, staff, transportation and anything necessary to the operation of the center.	T	S-PS
	Name seven different types of child care programs.	I	S-PS
	Define the philosophy of five defferent types of child care programs and explain how each program functions.	I	S
	Plan your own child care program, including physical plan, equipment, daily schedule, goals and objectives, types of children to be cared for, fund raising, staff, etc.	I	S-PS
olidays 2nd yr.	The student will be able to name and explain at least 15 major holidays with dates, write up an activity to explain and promote ten of the fifteen, performing one holiday activity with the children and set up and run a holiday party.	T	S-PS
	Discuss the values of holiday recognition.	I	S-PS

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Holidays (cont'd.)	Choose ten holidays and write up a plan or activity to explain and promote each holiday with the preschoolers.	I	S
	Name at least 15 major holidays, their dates and a short paragraph explaining the significance of each.	I	S
	Choose one holiday and make a booklet explaining the holiday, include background, people, customs, etc. Also illustrate, using pictures or drawings.	I	S
	Perform one holiday activity with the preschoolers.	I	S-PS
	Set up and run one holiday party.	I	S
Bulletin Board 2nd yr.	The student will be able to name ten uses of the bulletin board in the preschool classroom, compiling a booklet of themes which will be used to design a bulletin board for a curriculum area. The children will be involved in constructing this bulletin board.	T	S
	Name 10 uses of the bulletin board in a preschool.	I	S
	Compile a booklet of bulletin board themes.	I	S
	Make up a bulletin board for a particular area.	I	S
	Involve children in constructing a bulletin board.	I	S-PS
Outdoor Play 1st yr.	The student will be able to assist the teacher during an outdoor or gym period, plan and carry out one outdoor play activity and make a list of appropriate gym activities. The student will also be able to design on paper an outdoor play area with appropriate equipment.	T	S-PS
	Assist teacher with supervision of outdoor play period.	I	S
	Design an outdoor playground for preschoolers with appropriate equipment and discuss equipment needed and why.	I	S-PS
	Plan and carry out one to six outdoor play activities.	I	S-PS
	Make a list of activities with directions appropriate for use with preschoolers in the gym.	I	S
	Plan and carry out a gym activity.	I	S-PS
	Discuss the value of gross motor development (Sandbox)	I	S-PS

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CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Parent Involvement 2nd yr.	The student will be able to name 10 and create three of those 10 ways that teachers and parents communicate. In addition, the students will plan and successfully carry out a parents' night.	T	S-PS
	Name and describe 10 ways for teachers and parents to communicate.	I	S-PS
	Create three of the 10 ways that parents communicate and use them.	I	S-PS
	Plan a parents' night, naming and explaining the necessary steps to accomplish it.	I	S-PS
	Carry out successfully a parents' night.	I	S-PS
Language Arts 2nd yr.	The student will be able name fifteen language arts materials and explain their use with preschoolers, name five values of offering language arts in a preschool curriculum; plan an activity in each of the following areas and successfully carry out 1-6 of them: story-telling, poetry, finger plays, flannelboard, puppets, imaginary trips.	T	S-PS
	Name 15 kinds of language arts materials and how to use them with preschoolers	I	S-PS
	Name at least five values of language arts in the preschool curriculum.	I	S-PS
	Make up an activity in each of the following areas: story-telling, poetry, finger plays, flannelboard, puppets, imaginary trips, singing.	I	S-PS
	Carry out 1-6 activities with preschoolers in the following areas: story-telling, poetry, finger plays, flannelboard, puppets, imaginary trips, singing.	I	S-PS
	Evaluate the activities performed.	I	PS
Math 2nd yr.	The student will be able to name 25 math materials, at least ten areas of math that are dealth with, four motivating techniques use in a math curriculum; name and explain five reasons to include math in the curriculum, write a paragraph to explain how math is a part of intellectual development and perform 1-6 math activities with the preschoolers and evaluate the activities performed.	T	S-PS
	Name 25 types of math materials to be used with preschoolers and explain their use.	I	S
	Name 10 areas of math that are dealth with when working with preschoolers.	I	S-PS

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Math (cont'd.)	Name and explain at least five values math holds in a preschool curriculum.	I	S
	Explain math in relation to intellectual development.	I	S-PS
	Name at least four motivating techniques use in prompting math activities.	I	S-PS
	Write up and perform 1-6 math activities with the preschoolers.	I	S-PS
	Evaluate the activities performed.	I	PS
Music 2nd yr.	The student will be able to name five benefits of doing musical activities with preschoolers, list at least ten musical activities to be done with the preschoolers using musical instruments, ten using rhythmic movement and name ten homemade instrucments, making one with the children. The student will also be able to do musical activities with the preschoolers, in the areas of singing, listening, rhythm, movement and dance.	T	S-PS
	Name five benefits of using musical activities with preschoolers.	I	S
	Do one musical activity with the preschoolers using their voices.	I	S-PS
	Name ten homemade instrucments, and make one with with preschoolers.	I	S
	Name ten rhythmic movement activites and carry out one in each of the areas of listening, rhythm, movement and dance.	I	S-PS
	Name and explain ten misical activities to be done with preschoolers using musical instruments.	I	S-PS
Science and Nature 2nd yr.	The student will be able to make up a detailed science resource unit out of 20 to use with preschoolers, including at least 20 different types of science materials, six different types of experiences relating to science and nature, perform 1-6 of these activities with the children, evaluating them, and give five values that science holds in a preschool curriculum.	T	S-PS
	Name 20 materials used with preschoolers in science and their uses.	I	S
	Name five values that science holds in the preschool curriculum.	I	S-PS
	Plan at least six types of experiences that could be used with preschoolers in the field of science and nature.	I	S-PS
	Name 20 science units that can be used with preschoolers and briefly explain.	I	S

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Science and Nature (cont'd)	Make up a detailed science resource unit to use with preschoolers.	I	S-PS
	Perform 1-6 science activities with preschoolers.	I	S-PS
	Evaluate the activities performed.	I	PS
Exceptional Child 2nd yr.	The student will be able to name and give the characteristics of seven different types of exceptional children, and be able to give examples of treatment programs for each of the types of exceptional children. The students will be able to write a detailed report on one type of exceptional child, including characteristics, causes, treatment programs, special considerations and any information pertinent to the particular type of exception.	T	S-PS
	Name seven different types of exceptional children.	I	S-PS
	Name and given characteristics of different types of exceptional children.	I	S-PS
	Given examples of ptrgrams for exceptional children.	I	S
	Write a detailed report on one type of exceptional child.	I	S
Administration 2nd yr.	The student will be able to set up a day care budget for 25 children, totaling $30,000, listing all sources of funding and necessary public contacts for one year's program.	T	PS
	Set up a day care budget for 25 children totaling $30,000.	I	PS
	List all sources of funding for program.	I	PS
	List all necessary public contacts necessary for one year's program.	I	PS
Supervision 2nd yr.	Write criteria for selection and outstanding performance of teaching staff and discuss performance observations with staff members.	T	PS
	Write criteria for selecting teaching staff.	I	PS
	Write criteria for outstanding performance.	I	PS
	Discuss observations with staff members.	I	PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Case Study 1st yr.	The student will be able to write a case study of a chosen child from ages 4-6 years, using a standard given form citing specific examples and then forming assumptions.	T	S
	Given a standard form, choose a child from ages 4-6 years and write a detailed report describing his/her behavior using specific examples.	I	S
	Using the report, the student will draw conclusions about the child.	I	S
Television 1st yr.	The student will be able to list and explain ways that television could influence a preschooler.	T	S-PS
	Name and explain six ways that television could influence a preschooler.	I	S-PS
Recordkeeping 1st/2nd yrs.	Maintain a record keeping system which evaluates children's progress.	T	PS
	Maintain daily records of children's activities.	I	S-PS
	Evaluate daily records.	I	S-PS
	Develop written progress reports which include information from record keeping materials.	I	PS

PROGRAM: CHILD CARE

PREPARED BY: NANCY CHASE, LORI LEONE, SUSAN BARBER

SCHOOL: SALEM HIGH SCHOOL - KEENE STATE COLLEGE

	OCCUPATIONAL / TITLES	O.E. No	D.O.T. No.	UNIT OR SKILL TITLE: Observation; Child Care Aide; Speech Env. - Curr. Dev.; Discipline - Child Guid.; Universal Needs; Character of 4-6 yr. old; Child Influences; Child's Play; Nutritional Needs; Clothing; Foods; Health; Safety; Sex-Stereotyping; Careers; Child Abuse; Art; Field Trips; Other Cultures; Holidays; Bulletin Board; Outdoor Play; Parent Involvement; Language Arts; Math; Music; Science and Nature; Exceptional Child; Administration; Supervision; Case Study; Television; Record Keeping
SECONDARY	Nursemaid		307.878	R O O R R R R R R R R R R O O R O R O O O R O O O O O O O O O O O
	Kindergartner		359.878	R R O R R R R R R O O R R R R O R R O O O C R O O O R R O O O O O O
	Foster Mother		309.878	R O O R R O R R R R O R R R O C R O R O O O C R O O O R O O O O O O
	Child Care Attendant		359.878	R O O R R R R R R O R R R R O R O O O O O O R O O O O O O O O O O O
	Child Care Assistant		359.878	R R R R R R R R R R R R R R R R R R R R R R O O O R O R R R R O O O O O
	Teacher, Nursery School		359.878	R R R R R R R R R R R R R R R R R R R R R R R R R R R R R R R R R R
ARTICULATED	Child Care Attendant		355.878	R R O R R R R R R O O R R R R O R R O O O O R O O O O O O O O O O O
	Child Care Assistant		359.878	R R O R R R R R R O O R R R R O R R O O O O R O R R R R O O O O O O
	Kindergartner		359.878	R R O R R R R R R O O R R R R O R R O O O O R R O R O R O O O O O O
	Teacher, Nursery School		359.878	R R R R R R R R R R R R R R R R R R O R R R R R R R R R R R R R R R
POST SECONDARY	Nursemaid		307.878	R O O R R O R R O R O R R R O O R O O O O O O O O O O O O O O O O O
	Foster Mother		309.878	R O O R R O R R O R O R R R O O R O O O O O C O O O O O O O O O O O
	Child Care Attendant		355.878	R O O R R O R R O R O R R R O O R O O O O O O O O O O O O O O O O O
	Child Care Assistant		359.878	R O O R R O R R O R O R R R O O R O O O O O C O O O O O O O O O O O
	Kindergartner		359.878	R O O R R O R R O R O R R R O R O O O O O O O O O O O O O O O O O O
	Teacher, Nursery School		359.878	R R R R R R R R R O R R R O R R R R R R R R R R R R R O O R O R
	Teacher, Secondry School		091.118	R R R R R R R R R O R R R R R R R R R R R R R R R R R O O R O R
	Director - Educ. Progrm.		099.118	R R R R R R R R R O R R R R R R R R R R R R R R R R R R R O R

CODE:
R = REQUIRED
O = OPTIONAL

THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

VOCATIONAL SKILL AREA: CULINARY ARTS

PARTICIPANTS: DOUGLAS A. COONS, DOVER HIGH SCHOOL, DOVER, NH

PETER C. LEWIS, NEW HAMPSHIRE VOCATIONAL TECHNICAL COLLEGE, BERLIN, NH

WORKSHOP DATES: JUNE 27, 1977 - JULY 1, 1977
KEENE STATE COLLEGE, KEENE, NH

Activities supported by the N.H. State Department of Education, Vocational-Technical Division under the authority of Section 553 of the Education Professions Development Act.

SECTION II

THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

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EXPLANATION OF ZONES

We have taken unit or skill titles and have divided them into five distinct zones for the purpose of identifying articulated skills on the secondary and post-secondary levels.

Zone One on both secondary and post-secondary levels concerns itself with general/personal hygiene and sanitation before handling foods; individual and classroom safety and skills necessary for being able to interpret and produce recipes.

Zone Two on the secondary and post-secondary levels is concerned with obtaining necessary food ingredients in desired quantities and quality; being able to recognize and use storage procedures and being accountable for costs in terms of ingredients/product costs and menu pricing.

Zone Three is concerned with methodologies and skills of food preparation, recognizing marketable food products according to classification and recognizing problem areas in each classification and being able to employ remedial techniques to resolve the problems.

Zone Four is concerned with food cost and cost accountability; personnel coordination and management and food interpretation.

Zone Five is concerned with techniques of management associated with the food service industry and with the managerial controls necessary in food service.

EXPLANATION OF PLACEMENT OF TERMINAL OBJECTIVES

With the exception of Zone Two (Unit Costing, Cost Computation and Menu Pricing) and Zone Three (Food Preparation), all terminal objectives for secondary and post-secondary levels appear at the heading. In the other two instances, they appear at the conclusion of the curriculum articulation form to identify depth and emphasis differences between the secondary and post-secondary levels.

EXPLANATION OF DEPTH AND EMPHASIS

Articulation concentrates on four of the five zones on the articulation graph:

1. Both of us feel Zone One is essential on the secondary and post-secondary levels because of the necessity of maintaining high standards in personal and general hygiene before handling foods; the safety of the individual and classroom; and the skills necessary to be able to interpret and produce recipes.

2. In Zone Two, the degrees of emphasis begin to indicate a variance of depth, in that both the secondary and post-secondary levels concentrate on obtaining necessary food ingredients in desired quantities and quality, and in being able to recognize and use storage procedures. On the post-secondary level, however, a considerable degree of emphasis is placed upon being accountable for costs in terms of ingredient/product costs and menu pricing.

3. In Zone Three, both the secondary and post-secondary levels emphasize the methodologies and skills of food preparation and in being able to recognize a marketable food product. The depth, however, on the post-secondary level also encompasses the recognition of problem areas in each classification of food preparation and in being able to employ remedial techniques to resolve these problems. The post-secondary level also emphasizes specialization within each of these areas of food preparation.

4. In Zones Four and Five, the variation in terms of emphasis and depth become apparent in that the secondary level concentrates primarily on menu terminologies and planning, while the post-secondary level concerns itself with not only the skills associated with the menu, but also food cost accounting, personnel coordination and food service management techniques and controls.

NON-AGREEMENT STATEMENT

For the purposes of this Articulation Workshop, there were no differences of opinion on the part of either participant. In both cases, a greater degree of awareness as to what occurs on the secondary and post-secondary levels developed. It should be understood that in terms of degree of emphasis and depth, there are differences; but in terms of philosophical concepts about food service education, there were no disagreements.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Personal Hygiene and Sanitation	Each student, in working on the job, should be aware of the importance of sanitation, its meaning and the most effective method of assuring the meeting of requirements of the Board of Health in personal practices and appearance.	T	S-PS
	Each student must demonstrate proper personal hygiene rules by wearing clean white uniforms in the labs and keeping a clean appearance and body.	I	S-PS
	Given 9 questions from a safety rule sheet passed out in class, each student must complete a worksheet on safety rules of personal hygiene with 80% or better accuracy.	I	S-PS
	Each student must demonstrate proper personal grooming rules by dress and personal appearance in production labs and by keeping hair covered.	I	S-PS
	Each student must read and complete a personal grooming checklist provided in class covering six areas of personal grooming.	I	S-PS
	The student should be able to define the term "sanitation" and identify all the causes of food poisoning/illnesses, to the instructor's satisfaction.	I	S-PS
	Given a kitchen, the student would be able to recognize the importance of and plan a cleaning program for the job, to the instructor's satisfaction.	I	S-PS
	The student should recognize the importance of on the job training and develop the methods necessary to maintain good sanitation in accordance with the rules of sanitation.	I	S-PS
	Each student must observe and use kitchen sanitation rules which have been provided on a sheet handed out in class, while working in production labs.	I	S-PS
	Each student must observe and use all proper washing techniques while working in production labs.	I	S-PS

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Personal Hygiene and Sanitation (cont'd.)	Each student will complete, written or orally, the three main steps of washing, on paper or to the instructor, describing each step completely, with 100% accuracy.	I	S-PS
	Each student will observe and use all sanitation rules pertaining to all areas of commercial kitchens, while working in production labs.	I	S-PS
Shop Safety	Each student, when confronted with a kitchen which can be potentially hazardous, must recognize the most hazardous areas and maintain and practice a safe, hazard-free kitchen to the instructor's standards.	T	S-PS
	The student must know and use safety in food preparation when working with food preparing recipes in production labs, according to rules covered in class.	I	S-PS
	The student must know and use safety with hand equipment when working with hand equipment preparing recipes in production labs, according to rules covered in class.	I	S-PS
	The student must know and use safety with stationary equipment when working with stationary equipment preparing recipes in production labs, according to rules covered in class.	I	S-PS
	The student must know and use safety with clothing when working in production labs, according to rules covered in class.	I	S-PS
	The student must know and use safety with floors when working in production labs, according to rules covered in class.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec.
Shop Safety (cont'd.)	Each student will provide on-the-job training/seminars on safety, sanitation and fire prevention by utilizing movies, speakers and signs to help employees become aware of the shop safety issues. In addition, students will be able to identify hazardous areas by localizing with signs and/or different colors on floors, walls, etc. The student will also be able to provide demonstrations on hazardous and correct methods of practicing good safety sanitation and fire prevention.	I	PS
	Each student will be able to demonstrate how to encourage employee practice by using a reward and/or merit system.	I	PS
	Each student will be able to demonstrate how to periodically reinforce the prinicples covered in seminars, movies or demonstrations.	I	PS
Equipment Safety	The student will use proper safety techniques when using both large and small equipment in production labs. This will be done according to the shop safety procedures and to the satisfaction of the instructor.	T	S
	Given a ditchen, the student whold be able to instruct others in the importance of sanitation/safety/fire prevention with equipment; the means by which hazardous areas are recognized and also be able to develop a follow through program of safe practices to assure a safe kitchen.	T	PS
	Each student, using implements and necessary food and material, after a demonstration by the instructor, will be able to demonstrate proper use of basic cutting implements to the satisfaction of the instructor.	I	S-PS
	Each student, using necessary implements and materials, after demonstration by the instructor, will be able to demonstrate proper sharpening and maintenance of cutting implements to the satisfaction of the instructor.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec
Equipment Safety (cont'd.)	Each student, using implements and storage areas required, will demonstrate proper and safe storage of cutting implements to the satisfaction of the instructor.	I	S-PS
	Each student, using implements in production labs, after demonstration by the instructor, will show proper use of food handling implements.	I	S-PS
	Each student, using implements in production labs, after demonstration by the instructor, will demonstrate proper use of food preparation implements, to the satisfaction of the instructor.	I	S-PS
	Each student, using utensils in production labs and after demonstration by the instructor, will demonstrate proper use of cooking utensils, to the satisfaction of the instructor.	I	S-PS
	Each student, using baking implements in production labs after demonstration by the instructor, will demonstrate proper use of baking implements, to the satisfaction of the instructor.	I	S-PS
	Each student, using fryer in production labs, after demonstration by the instructor, will demonstrate proper and safe usage of the deep fryer, to the satisfaction of the instructor.	I	S-PS
	Each student, using mixers in production labs after demonstration by the instructor, will demonstrate proper and safe use of mixing machines, to the satisfaction of the instructor.	I	S-PS
	Each student, using a slicer in production labs, after demonstration by the instructor, will demonstrate the proper and safe usage of the slicer, to the satsifaction of the instructor.	I	S-PS

5.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec.
Equipment Safety (cont'd.)	Each student will, using convection oven in production labs, after demonstration by the instructor, will demonstrate proper and safe use of convection oven to the satisfaction of the instructor.	I	S-PS
	Each student, using microwave oven in production labs, after demonstration by the instructor, will be able to demonstrate proper and safe use of microwave ovens, to the satisfaction of the instructor.	I	S-PS
	Each student, using a range in production labs, after demonstration by the instructor, will be able to demonstrate proper and safe use of ranges, to the satisfaction of the instructor.	I	S-PS
	Each student, using a broiler in production labs, after demonstration by the instructor, will be able to demonstrate proper and safe use of broilers, to the satisfaction of the instructor.	I	S-PS
	Each student, using roasting ovens in production labs, after demonstration by the instructor, will be able to demonstrate the proper and safe usage of roasting ovens, to the satisfaction of the instructor.	I	S-PS
	Each student, using proof box in production labs, after demonstration by the instructor, will demonstrate proper and safe usage of proof boxes, to the satisfaction of the instructor.	I	S-PS
	Each student, using dishwasher in production labs, after demonstration by the instructor, will demonstrate proper and safe use of dishwashers, to the satisfaction of the instructor.	I	S-PS
	Each student, using the grill in production labs, after a demonstration by the instructor, will demonstrate proper and safe usage of grills, to the satisfaction of the instructor.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Measurements	The student will measure food materials for lab production using volume measures, scales or scoops. This will be done according to instruction on standard recipes.	T	S-PS
	Each student, using standard scoops to measure ingredients for recipes in production labs, will be able to identify and use standard scoops for measuring, accurately, according to recipe quantities needed.	I	S-PS
	Using standard cups to measure ingredients for recipes in production labs, each student will identify and use standard cups for measuring, accurately, according to recipe quantities needed.	I	S-PS
	Using scales to weigh ingredients for recipes in production labs, each student will identify and use scales for weighing, accurately, according to recipe quantities needed.	I	S-PS
	Using pounds and ounces to weigh ingredients for recipes in production labs, each student will identify and use pound weights and ounce weights accurately, according to recipe quantities needed.	I	S-PS
	Using volume measure to measure ingredients for recipes in production labs, each student will identify and use volume measures accurately, according to recipe quantities needed.	I	S-PS
	The student should be able to convert standard measurements to metric and imperial measurement standards with 100% accuracy.	I	PS
	Given a production sheet with predictions, the student will be able to record clearly, by departments, the required quantities of each menu item to be prepared.	I	PS
	Each student, when given a food requirement problem, will be able to compute food requirements, methods for ordering, methods for ordering the best food products at the best price in accordance with the menu.	I	PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec.
Using and Converting Recipes	Each student, when given a production sheet problem, will be able to determine and assign quantities for each menu item to be prepared for a given day with necessary conversions on recipes to assure accuracy in taste, color, texture, and flavor of food dishes.	T	S-PS
	Each student will recite orally or write on paper the food and material necessary for the preparation of a recipe for Chocolate Chip cookies, with 90% or better accuracy.	I	S
	Using the necessary food and material(s), each student will prepare one recipe of Chocolate Chip cookies, according to the Food Trades Quality Standards and to the satisfaction of the instructor.	I	S
	Each student will recite orally or write on paper, the figures necessary for preparing a one-half recipe of Chocolate Chip cookies with 90% or better accuracy.	I	S
	Given a scrambled recipe, each student will write it in standard form on a 3 x 5 index card, including the food necessary, measurements, steps in order, time required and quantity served, with 100% accuracy.	I	S
	Students should be able to take the recipe conversion formulae and in a series of assigned problems, convert those recipes, increasing and decreasing quantities as indicated in the problem, with 100% accuracy.	I	PS
Identifying and Using Ingredients	The student will identify and use food ingredients for preparing standard recipes in lab production. This will be done according to the Food Trades Quality Standards and to the satisfaction of the instructor.	T	S
	The student will be able to identify food ingredients, their composition, usage and restrictions in the preparation of all food/baked item found in food service.	T	PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec.
Identifying and Using Ingredients (cont'd.)	Using vegetables for recipes in production lab, each student will identify and use vegetables according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using vegetable products for recipes in production labs, each student will identify and use vegetable products, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using meats for recipes in production labs, each student will identify and use meats, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using meat products for recipes in production labs, each student will identify and use meat products according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using venegars for recipes in production labs, each student will identify and use various types of vinegars, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using dressings for recipes in production labs, each student will identify and use various types of dressings, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using seasonings for recipes in production labs, each studnet will identify and use various types of seasonings, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using various types of milk for recipes in production labs, each student will identify and use types of milk, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE I	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec.
Identifying and Using Ingredients (cont'd.)	Using milk products for recipes in production labs, each student will identify and use milk products, according to Food Trades Quality Standards and to the satisfaction for the instructor.	I	S-PS
	Using sugars in recipes in production labs, each student will identify and use sugars, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using sweetening agents for recipes in production labs, each student will identify and use sweetening agents, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using baking ingredients for recipes in production labs, each student will identify and use baking ingredients, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using various types of flours for recipes in production labs, each student will identify and use various types of flours, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using thickening agents for recipes in production labs, each student will identify and use thickening agents, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using seafood for recipes in production labs, each student will identify and use seafood, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using seafood products in production labs, each student will identify and use seafood products according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = PostSec.
ZONE I			
Identifying and Using Ingredients (cont'd.)	Using eggs for recipes in production labs, each student will identif and use eggs according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using egg products for recipes in production labs, each student will identify and use egg products according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using convenience foods in production labs, each student will identify and use convenience foods in accordance with Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using fruits for recipes in production labs, each student will identify and use fruits, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
	Using fruit products for recipes in production labs, each student will identify and use fruit products, according to Food Trades Quality Standards and to the satisfaction of the instructor.	I	S-PS
ZONE II			
Unit Costing, Cost Computation and Menu Pricing	Using basic math techniques, the student will compute recipe costs. This will be accomplished by using standard recipes and present market prices.	T	S-PS
	Each student will recite orally or write on paper the amounts of ingredients and the cost figures necessary for costing a recipe of Chocolate Chip cookies, using present market prices, with 100% accuracy.	I	S-PS
	Each student will write on paper the computations necessary for costing a recipe of Chocolate Chip cookies using present market prices, within 2¢ (two cents) of the correct price.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER_____

UNIT OR SKILL TITLE ZONE II	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post Sec.
Unit Costing, Cost Computation and Menu Pricing (cont'd.)	The student should be able to take basic cost computation techniques and develop a menu selling price using one of seven food cost/pricing techniques, depending upon the type of food service operation.	I/T	PS
Requisitioning	The student will prepare a food list for the instructor that will show the amount and type of food necessary for production lab. The instructor will be responsible for ordering requested food items for student needs in production labs.	T	S
	The student, when assigned to the chef's position for a given laboratory/production exercise, will be held responsible for ordering of all food supplies required for menu production by all other student with assigned tasks in food preparation, with 100% accuracy.	T	PS
	Each student will prepare the quantity required of each item on the requisition sheet with regard to quantity and item description (quality and item specifications.)	I	S-PS
	Given a menu and a menu sales analysis form, the student should be able to prepare requisition sheets with quantities, qualities and specifications necessary to satisfy the menu's requirements.	I	PS
Storage Procedures	The student will be able to recognize the importance and necessity of food storage procedures and will demonstrate to the instructor's satisfaction, in written and practical exercises, the ability to develop, implement and evaluate the necessary procedures required to assure the maximum security of food products.	T	S-PS
	The student will demonstrate the peoper receiving techniques for food and staple goods to account for all items in terms of quantity, quality and prices.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE II	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post Sec
Storage Procedures (cont'd.)	The student will be able to segment foods according to food service standards, to proper storage areas: dry goods, walk-in and freezer.	I	S-PS
	The student will be able to demonstrate in written and practical exercises, the proper storage accounting required to verify department operational figures.	I	PS
	The student will use proper storage in food service while working in production labs to the satisfaction of the instructor.	I	S-PS
	Given instruction on storage, the student will describe, either written or orally, the general storage requirements to the satisfaction of the instructor.	I	S
	The student will use proper care of food in storage while working in production labs according to kitchen sanitation rules and to the satisfaction of the instructor.	I	S-PS
	The student will use proper storage of perishable and semi-perishable foods while working in production labs according to kitchen sanitation rules and the satisfaction of the instructor.	I	S-PS
	The student will use proper techniques in refrigerated storages while working in production labs according to kitchen sanitation rules and the satisfaction of the instructor.	I	S-PS
	The student will use proper techniques in frozen food storages while working in production labs according to kitchen sanitation rules and the satisfaction of the instructor.	I	S-PS
	The student will use general storage practices, provided on a sheet in class, while working in production labs to the satisfaction of the instructor.	I	S-PS

13.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE II	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec
Storage Procedures (cont'd)	The student will organize and clean the storeroom at least once a month, while working in production labs according to sanitation rules and the satisfaction of the instructor.	I	S-PS
	The student will clean and organize refrigerated storages at least every two weeks, while working in production labs according to sanitation rules and the satisfaction of the instructor.	I	S-PS
	The student will organize frozen food storages, at least once each month, while working in production labs according to sanitation rules and the satisfaction of the instructor.	I	S-PS
ZONE III			
Cooking Methods	The student, given any recipe, will demonstrate, during lab production, the use of dry heat, moist heat and frying methods. This will be done according to the Food Trades Quality Standards and the satisfaction of the instructor.	T	S
	The student will be able to demonstrate in written and practical exercises, knowledge of the intricacies associated with dry, moist, combination methods of cooking techniques which are found in all food service operations, to the satisfaction of the instructor.	T	PS
	The student will demonstrate how to use the roasting method of dry heat cooking while preparing recipes in production labs, according to the Food Trades Quality Standards and the satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the panbroiling method of dry heat cooking while preparing recipes in production labs, according to the Food Trades Quality Standards and the satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the broiling method of dry heat cooking while preparing recipes in production labs, according to the Food Trades Quality Standards and the satisfaction of the instructor.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE III	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Cooking Methods	The student will demonstrate how to use the baking method of dry heat cooking while preparing recipes in production labs, according to the Food Trades Quality Standards and the satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the braising method of moist heat cooking while preparing recipes in production labs, according to the Food Trades Quality Standards and the satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the steaming method of moist heat cooking while preparing recipes in production labs, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the cooking in liquid method of moist heat cooking while preparing recipes in production labs, according to the Food Trade Quality Standards and satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the sauteing method of frying while preparing recipes in production labs, according to Food Trades Quality Standards and satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the grilling method of frying while preparing recipes in production labs, according to Food Trades Quality Standards and satisfaction of the instructor.	I	S-PS
	The student will demonstrate how to use the deep fat method of frying while preparing recipes in production labs, according to Food Trades Quality Standards and satisfaction of the instructor.	I	S-PS
Food Preparatio	The student will demonstrate the preparation of an a basic knowledge in the areas of salads, appetizers, vegetable cookery, quickbreads and layer cakes and cupcakes. This will be done according to the Food Trades Quality Standards, through written work and to the satisfaction of the instructor.	T	S

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE III	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec
Food Preparation (cont'd.)	Given food and material necessary, the student will prepare 9 of the 15 recipes in the salads unit using proper preparation techniques, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using proper preparation techniques and given food and material necessary, the student will prepare 3 of the 5 recipes in the salads unit on salad dressings, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using provided worksheets and reference texts in class, the student will complete related worksheets on salds with 80% or better accuracy.	I	S
	Each student will complete a written or oral final exam consisting of 50 questions covering salads and salad dressings unit information with 80% or better accuracy.	I	S
	Using proper preparation techniques and given food and material necessary, each student will prepare 12 of the 26 recipes in the appetizer unit, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using provided worksheets and reference texts in class, each student will complete related worksheets on appetizers with 80% or better accuracy.	I	S
	Each student will complete a written or oral final exam consisting of 50 questions covering appetizer unit information with 80% or better accuracy.	I	S
	Using proper preparation techniques and given food and material necessary, each student will prepare 17 or the 40 recipes in the vegetable unit, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using provided worksheets and reference texts in class, each student will complete related worksheets on vegetable cookery with 80% or better accuracy.	I	S

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE III	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Food Preparation (cont'd.)	Each student will complete a written or oral final exam consisting of 50 questions covering vegetable unit information with 80% or better accuracy.	I	S
	Using proper preparation techniques and given food and material necessary, each student will prepare 12 or the 17 recipes in the stocks and soups unit according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using provided worksheets and reference texts in class, each student will complete related worksheets on stocks and soups with 80% or better accuracy.	I	S
	Each student will complete a written or oral final exam consisting of 50 questions covering stocks and soups unit information with 80% or better accuracy.	I	S
	Using proper preparation techniques and given food and material necessary, each student will prepare 11 of the 17 recipes in the quickbread unit, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using provided worksheets and reference texts in class, each student will complete related worksheets on quickbreads, with 80% or better accuracy.	I	S
	Each student will complete a written or oral final exam consisting of 50 questions covering quickbread unit information with 80% or better accuracy.	I	S
	Using proper preparation techniques and given food and material necessary, each student will propare 7 of the 10 recipes in the layer cakes and cupcakes unit on: blended, creamed or whipped cakes, according to the Food Trades Qulity Standards and the satisfaction of the instructor.	I	S

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE ZONE III	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Food Preparation (cont'd.)	Using proper preparation techniques and given food and material necessary, each student will prepare 3 of the 4 recipes in the layer cakes and cupcakes unit on variety frosting, according to the Food Trades Quality Standards and satisfaction of the instructor.	I	S
	Using provided worksheets and reference texts in class, each student will complete related worksheets on layer cakes and cupcakes with 80% or better accuracy.	I	S
	Each student will complete a written or oral final exam consisting of 50 questions covering layer cakes and cupcakes unit information with 80% or better accuracy.	I	S
	Each student will be able to relieve any member of the staff and be able to do the following successfully: prepare breakfast/short order items consisting of egg dishes, pancakes, waffles, meat dishes, breakfast side orders of potatoes, grits and toast.	I	PS
	Each student will be able to relieve any member of the staff and be able to do the following successfully: prepare pantry items consisting of salads, dressings, cold appetizers, cold plates and desserts.	I	PS
	Each student will be able to relieve any member of the staff and be able to do the following successfully: broil, fry, roast, saute, steam meats and vegetables.	I	PS
	Each student will be able to relieve any member of the staff and be able to do the following successfully: prepare baked/bread food items consisting of cakes, icings, pies, puddings, loaf breads and rolls.	I	PS

CURRICULUM ARTICULATION

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post Sec
ZONE III			
Food Preparation (cont'd.)	Each student will be able to relieve any member of the staff and be able to d the following successfully: prepare stocks; thick and clear soups. a. use bones or bases for stocks with water: brown, white, neutral and fish stocks; b. consommes - garnishes, vegetable soups (clear soups); c. prepare roux, incorporate stocks/rouxs, know when to add milk and/or cream (thick soups).	I	PS
	Each student will be able to relieve any member of the staff and be able to do the following successfully: prepare five basic sauces and compound sauces: a. espagnole (brown) sauce: borderlaise, mushroom, burgundy; b. bechamel (cream) sauce: mustard, cheese; c. veloute sauce: bercy sauce, veronique sauce; d. tomato sauce; e. hollandaise sauce	I	PS
	The student must demonstrate, in a written exercise and in practical exercises proficiency in the intricacies of basic food preparation, baking, cooking and finishing techniques, as established by the food service industry and to the instructor's specifications.	T	PS
ZONE IV			
Menu Terminologies	The student will use menu terms that are included in the culinary term sheet. The will be accomplished by conpleting definitions and by monthly testing.	T	S
	The student will plan and write menus using the proper terms and techniques as described in class. The student will develop a cyclic menu according to the menu writing standards.	T	S
	The student should be able to spell, identify and describe the menu terminologies which appear on Table d'hote, semi-aLa Carte and a La Carte menus.	T	PS

CURRICULUM ARTICULATION

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UNIT OR SKILL TITLE ZONE IV	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec
Menu Terminologies (cont'd.)	The student, when producing food dishes, should be able to recognize what menu terminologies mean in the production of food items which is measured in a final exam of matching and association questions.	T	PS
	Each student will know and use menu terms from a list of 9 menu terms included in the culinary term list, completing accurate definitions according to the instructor's standards.	I	S
	Each student will complete a monthly menu term quiz covering 9 of the menu terms. This will be written or oral with 90% or better accuracy.	I	S
	The student will complete, written or orally, the 8 parts of a menu, on paper to the instructor, with 100% accuracy.	I	S-PS
	The student will complete, written or orally, the 4 classifications of menus, on paper or to the instructor, describing each classification completely, with 100% accuracy.	I	S-PS
	The student will complete, written or orally, the 12 steps of menu planning on paper or to the instructor describing each step completely with 100% accuracy.	I	S-PS
	The student will complete, written or orally, the 4 types of menus on paper or to the instructor, describing each type completey with 100% accuracy.	I	S-PS
	The student will complete on paper a 7-day cyclic menu on a menu form provided in class, according to menu writing standards and the satisfaction of the instructor.	I	S-PS

PROGRAM: CULINARY ARTS

PREPARED BY: PETER LEWIS - DOUG COONS

SCHOOL: N.H.V.T.C. BERLIN - GORHAM HIGH SCHOOL

	OCCUPATIONAL / TITLES	O.E. No.	D.O.T. No.
SECONDARY	Cook's Helper	17.2902	317.887
	Vegetable Cook	17.2902	314.781
	Asst. Soup/Sauce Cook	17.2902	314.781
	Asst. Roast/Broiler Ck.	17.2902	314.781
	Asst. Breakfast/Fry Ck.	17.2902	314.781
	Baker's Helper	17.2901	313.884
	Asst. Pastry Cook	17.2901	313.381
ARTICULATED	Pastry Worker	17.2902	001.010
	Breakfast/Fry Cook	17.2902	314.781
	Soup and Sauce Cook	17.2902	314.781
	Roast/Broiler Cook	17.2902	314.781
	Short Order Cook	17.2902	314.781
	Dovidagan	17.2902	314.781
	Baker	17.2901	526.781
	Pastry Cook	17.2901	313.381
	Second Cook	17.2902	.381
POST SECONDARY	Meatcutter	17.2903	.381
	Pastrycook	17.2901	.381
	Garde Manger	17.2902	313.781
	Chef De Froid	17.2902	.281
	Sous Chef	17.2902	.131
	Manager of Restaurant	17.2902	.131
	Chef	17.2902	131.010

ZONE #1 | ZONE #2 | ZONE #3 | ZONE #4 | ZONE #5

UNIT OR SKILL TITLE

General Orientation
Personal Hygiene
Food Sanitation
Equipment Safety
Insurance
Recipe Conversion
Ingredient Identification
Measuring
Terminology
Unit Costing
Cost Computations
Food Prep/Cooking Methods
Salads
Cold Appetizers
Hot Appetizers
Sandwiches
Vegetables
Soups
Sauces
Frying
Roasting
Sauteing
Broiling
Bread and Rolls
Desserts & Pastries
Pre-Processing
Purchasing
Receiving
Inventories
Food Quant. Prod. Sheets
Menu Terminologies
Menu Planning
Menu Cost Analysis
Menu Sales Analysis
Kitchen Techniques
Job Organization
Job Communication
Job Evaluation
Employee Scheduling
Employee Supervision
Report & Form Statement
Annual Budget

CODE:
R = REQUIRED
C = OPTIONAL

THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

VOCATIONAL SKILL AREA: ELECTRONICS

PARTICIPANTS: ROBERT REYNOLDS, NASHUA HIGH SCHOOL, NASHUA, NH

FRANK WANG, NEW HAMPSHIRE VOCATIONAL TECHNICAL COLLEGE, NASHUA, NH

WORKSHOP DATES: JUNE 27, 1977 - JULY 1, 1977
KEENE STATE COLLEGE, KEENE, NH

Activities supported by the N.H. State Department of Education, Vocational-Technical Division under the authority of Section 553 of the Education Professions Development Act.

SECTION III

EXPLANATION OF EMPHASIS AND DEPTH DIFFERENCES FOR SECONDARY AND POST-SECONDARY PROGRAMS IN ELECTRONICS

The attached series of objectives related to the study of electronics show only limited similarities and difference in instruction at the secondary and post-secondary levels.

In general, we find student graduates of secondary electronics programs are trained to enter industry at the job entry level as an electronic technician. The student graduate of a post-secondary program usually is prepared for higher level entry. Higher level entry is due to a greater depth and emphasis of study not always shown in the institutional objective. Two examples of this are: Course in D.C. Fundamental.

The post-secondary program greater depth in various theorems such as the Thevenin Theorem, Norton Theorem, Supposition Theorem, etc.

Mathematics plays a much greater role than at the high school level.

COURSE IN TRANSISTOR AMPLIFIER DESIGN

At the high school level, transistor design is based on the "rule of the thumb." At the post-secondary level the H - parameters Y - parameters, and T - parameters are stressed in circuit analysis and design.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Safety Rules	Students are aware of the potential hazards of the electricity and handtools.	T	S-PS
	List four causes of accidents.	I	S-PS
	List three hazards associated with electrical equipment.	I	S-PS
	List four precautions that would reduce the danger of electrical injury.	I	S-PS
	Name the major cause of 88% of all accidents.	I	S-PS
	List the three dangers in an electrical shop.	I	S-PS
	List the three elements that support fire.	I	S-PS
	Name the classification of fire that is more associated with an electrical shop.	I	S-PS
	Name the danger associated with cleaning solvents in an electrical shop.	I	S-PS
	Name a treatment for electrical shock.	I	S-PS
	List five shop safety rules.	I	S-PS
Basic Tools	To become acquainted with the descriptions and the applications of these basic hand and power tools.	T	S-PS
	The student will be able to identify and demonstrate the proper use of the following tools:		
	1) C-clamp	I	S-PS
	2) Crimping Tool	"	"
	3) Cutters, drill, file, hammer and knife	"	"
	4) Caliper, Combination square and divider	"	"
	5) Drill gauge and micrometer	"	"
	6) Rule, wire gauge, nibbler and pliers	"	"
	7) Punch, saw and screwdriver	"	"
	8) Soldering gun and iron	"	"
	9) Soldering aid	"	"
	10) Tap and Die, vises and wire strippers	"	"
	11) Wrenches and wire wrapping tools	"	"

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Schematic Symbols and Diagrams	To draw and identify the schematic symbols and to introduce the art of reading schematic diagrams.	T	S-PS
	A) Draw and identify the schematic symbols for the following electronic components: 1. Resistor (fixed) 2. Resistor (variable) 3. Capacitor (fixed) 4. Capacitor (variable) 5. Antenna 6. Voltmeter 7. Ammeter 8. Diode or rectifier 9. Transformer (iron core) 10. Transformer (air core) 11. Inductor (air core) 12. Inductor (iron core) 13. Lamp 14. Buzzer 15. Bell 16. Vacuum Tube 17. Transistor 18. Single cell 19. Battery 20. Fuse 21. Conductors (connectors) 22. Conductors (conductors crossing but not connected) 23. Single pole, single throw (SPST) switch 24. Push button (normally-opened, N.O.)	I	S-PS
	B) Identify block, pictorial and schematic diagrams.	I	S-PS
	C) When give a schematic diagram, the student must be able to properly trace the signal path and explain the function of the circuits.	I	PS
Soldering	To understand and apply the correct procedures to form electrically and mechanically sound solderal connections.	T	S-PS
	A) When given an oral test, the student must be able to properly: 1. identify the characteristics of solder and flux 2. describe the care and maintenance of soldering irons and guns 3. explain the necessity for a mechanical and electrical joint	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Soldering (cont'd)	B) When given a performance test, the student must be able to properly solder a wire connection. The student's grade will be based on the following performances: 1. cold solder joint 2. amount time of heat 3. defective solder joints 4. neatness and uniformity of the solder joints 5. insulation burned and melted 6. excessive solder on connections 7. soldered connections not cleaned properly 8. solder splashes 9. sharp solder joint	I	S-PS
Electrical Sources	To introduce the student to the various sources of electricity, their applications and conversions.	T	S-PS
	When given a written test, the student must correctly be able to: 1. list the six different methods of producing electricity	I	S
	2. describe how frictional/static electricity is produced	"	"
	3. identify the charges created in excess on different materials by frictional electricity	"	"
	4. identify the three necessary materials for making a wet cell	"	"
	5. distinguish between a cell and a battery	"	PS
	6. explain the difference between a dry cell and a wet cell	"	S
	7. identify two applications of producing electricity by pressure	"	"
	8. describe how heat produces electricity and name at least one application of producing electricity by heat	"	"
	9. identify one application of producing electricity by light	"	"
	10. name the method that produces the greatest amount of electricity used today	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Electrical Sources (cont'd)	11. Explain the difference between AC and DC voltage and current sources.	I	S-PS
	12. Explain converting voltage source to current source and current source to voltage source.	I	PS
	13. Identify the hot chassis and grounding problems.	I	PS
Circuit Fundamentals	The student must be able to properly recognize a circuit, draw a schematic diagram of a circuit, and identify the three basic types of circuits, namely: series, parallel and series-parallel.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. list the three necessary parts for a circuit	I	S
	2. draw a schematic diagram in which one switch can control either a lamp circuit or a buzzer circuit when given a 1½ V cell, a lamp, a buzzer, a SPST switch and connecting wires.	I	S
	3. identify a series circuit, a parallel circuit and a series-parallel circuit.	I	S
	4. analyze the above basic circuits using Kirchoff voltage and current laws.	I	PS
	5. analyze the above basic circuits using network theorems such as Therein's theorem, Norton's theorem and the loop current method.	I	PS
	6. analyze and solve delta to wye and wye to delta conversions.	I	PS
Color Codes	The student must be able to properly recognize and identify values of resistance and capacitance using appropriate EIA standard color codes.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. identify values of resistance when given three color bands.	I	S-PS
	2. identify percentage of tolerance when provided with a fourth color band on a resistor.	I	S-PS
	3. identify values of capacitance when given three color dots.	I	PS
	4. identify percentage of tolerance when provided with a fourth color dot.	I	PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Component Identification	The student must be able to readily recognize and identify the various electronic components.	T	S-PS
	When given an oral test, the student must be able to properly identify the following electronic components:		
	a. resistors (different types)	I	S-PS
	b. capacitors (" ")	"	"
	c. semi conductors (" ")	"	"
	d. transformers(" ")	"	"
	e. inductors (" ")	"	"
	f. integrated circuits (" ")	"	"
Ohm's Law	The student must be able to properly identify the three basic electrical quantities of a circuit, know their unit of measurement, be able to measure the electrical quantities, state their relationship (Ohm's Law), and put this knowledge to use in practical applications.	T	S-PS
	When given a written test, the student must be able to properly:		
	a. define voltage, current and resistance	I	S-PS
	b. identify the units of measurement for voltage, current and resistance	"	"
	c. identify the instrument that is used to measure voltage, current and resistance	"	"
	d. describe the relationship between voltage and current when resistance is kept constant.	"	"
	e. describe the relationship between current and resistance when voltage is kept constant	"	"
	f. write the three mathematical expressions for Ohm's Law	"	"
	g. solve the problem for the unknown electrial quantity when given the other two electrical quantities, e.g., solve for voltage when the values of current and resistance are given.	"	"
	h. describe two conditions when you connect a voltmeter in a D.C. circuit to measure voltage.	"	"

CURRICULUM ARTICULATION

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondar PS = Post-Sec
Ohm's Law (cont'd)	i. describe the two conditions when you connect an ammeter in a DC circuit to measure current	I	S-PS
	j. describe the most important rule you must follow when using an ohmmeter to measure resistance.	"	"
AC/DC Voltage, Current and Power	The student must be able to properly distinguish between alternating and direct current, know the different values of AC and value a VOM and an oscilloscope measures, know what frequency and different wave forms.	T	S-PS
	When given a written test, the student must be able to correctly:		
	a. explain the difference between AC and DC	I	S-PS
	b. define a cycle of alternating current	"	"
	c. define frequency	"	"
	d. identify the unit of measurement for frequency	"	"
	e. define a sine wave	"	"
	f. define RMS, peak, average, and peak-to-peak values of an AC voltage or current	"	"
	g. identify what value a voltmeter measures	"	"
	h. identify what value an oscilloscope measures	"	"
	i. explain the difference between a sinusoidal and a nonsinusoidal wave and list one example of each	"	"
	j. define electrical power	"	"
	k. write the formula for power in a DC circuit in terms of volts and current	"	"
	l. identify the unit of measurement for power	"	"
	m. write the formula for power in a DC circuit in terms of current and resistance	"	"
	n. identify the two reactive loads in an AC circuit	"	"
	o. identify the instrument to measure power	"	"
	p. calculate the power used by a load when given voltage and current or current and resistance	"	"
	q. explain why an incandescent lamp's resistance is different in a closed circuit as compared to its cold resistance when measured out of the circuit	"	"

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CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
AC/DC Voltage, Current and Power (cont'd.)	r. define real (or true) and apparent power in AC circuits	I	S-PS
	s. define power factor in AC circuits	"	"
	t. perform mathematical analysis of phasor relationship in AC circuitry	I	PS
	u. convert sine wave time domain to phasor domain	I	PS
Magnetism and Electromagnetism	The student must be able to properly identify the principles and application of magnetism and electromagnetism.	T	S-PS
	When given a written test, the student must be able to correctly:		
	a. identify by name, the area of influence in space around a permanent magnet	I	S-PS
	b. identify by name the magnets that can be found in Nature	"	"
	c. describe the direction of the lines of force about a bar magnet	"	"
	d. identify the number of poles in a magnet	"	"
	e. state in writing the basic magnetic law of attraction and repulsion	"	"
	f. identify magnetic and non-magnetic materials	"	"
"	g. list three methods that can damage permanent magnets	"	"
	h. list two methods to magnetize iron	"	"
	i. describe the relationship between current and magnetism	"	"
	j. show the direction of the magnetic field about a conductor	"	"
	k. identify the north and south poles of a coil of wire when direct current is passed through it by using the left-hand rule	"	"
	l. identify two factors that determine the strength of an electro-magnet	"	S
	m. identify the name for a wound coil that is made to produce a strong magnetic field	"	"
	n. define a relay	"	"
	o. list two advantages of a relay	"	"
	p. explain the operation of a buzzer or bell	"	"
	q. define the hysteresis loop of a ferromagnetic material	"	PS
	r. define Ampere's Circuitral Law of a magnetic current	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Inductor and its Application	The student will learn the characteristics of an inductor and its uses. The student will also develop skills in calculating inductance, inductive reactance and impedance of an RL circuit.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. define inductance	I	S-PS
	2. describe how to check a coil for an "open" or "short" with an ohmmeter	"	"
	3. calculate inductive reactance (X_L) when given the voltage across the coil (E_L) and the current through the coil	"	"
	4. calculate inductance when given the formula $L = X_L/2\ IIf$ and the frequency	"	"
	5. define the time constant of an RL circuit	"	"
	6. calculate the time constant of an RL circuit when given the formula $T=\frac{L}{R}$ and the values of inductance and resistance	"	"
	7. calculate total inductance when inductors are connected in series with no mutual inductance	"	"
	8. identify if total inductance, of two coils in series opposing with mutual inductance, increases or decreases	"	"
	9. calculate total inductance when inductors are connected in parallel with no mutual inductance	"	"
	10. describe inductive reactance	"	"
	11. identify unit of measurement for inductive reactance	"	"
	12. describe what happens to inductive reactance when frequency or inductance increases or decreases in a circuit. The student will be given the formula for inductive reactance, i.e. $X_L = 2IIf\ L$.	"	"
	13. define impedance in an RL circuit	"	"
	14. identify the unit of measurement and the letter symbol for impedance	"	"
	15. apply the mathematical expression for the current through the coil in analysis of an RL circuit	"	PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Capacitor and Its Application	The student will learn the characteristics of a capacitor and its uses; and will develop skills in calculating capacitance, capacitive reactance and impedance of an RC circuit.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. define capacitance	I	S-PS
	2. identify the different types of capacitors such as ceramic, mica, electrolytic, and paper capacitors	"	"
	3. explain why a capacitor is rated for maximum voltage	"	"
	4. describe how a capacitor can be tested with a VOM	"	"
	5. describe how a capacitor blocks direct current and passes alternating current	"	"
	6. calculate total capacitance when capacitors are connected in series	"	"
	7. calculate total capacitance when capacitors are connected in parallel	"	"
	8. calculate capacitive reactance when given the formula and values of frequency and capacitance of a circuit	"	"
	9. calculate total impedance of an RC circuit when given the formula and values of resistance and capacitance	"	"
	10. describe wheat happens to impedance in an RC circuit (R and C remain constant) when frequency is increased	"	"
	11. apply the mathematical expression for the voltage across the capacitor in analysis of an RC circuit	"	PS
	12. calculate the time constant of an RC circuit	"	S-PS
Transformer and Its Application	The student will learn the characteristics of a transformer and its uses; will develop skills in calculating primary and secondary turns, voltage, current and impedance ratios in addition to transformer efficiency.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. define a transformer	I	S-PS
	2. draw the schematic symbols of an air-core and an iron-core transformer	"	"
	3. describe how one would build a step-up transforer and a step-down transformer	"	"

CURRICULUM ARTICULATION

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Transformers and Its Application (cont'd.)	4. define turns ration, voltage ratio and current ratio	I	S-PS
	5. write the voltage ratio and turns ratio relationship in an equation form for a transformer	"	"
	6. write the voltage ratio and the current ratio relationship in an equation formfor a transformer	"	"
	7. write the current ratio and turns ratio relationship in equation form for a transformer	"	"
	8. solve numerical problems by using the above ratios	"	"
	9. identify an autotransformer by its schematic symbol	"	"
	10. calculate the transformer efficiency when given the input and output power of a transformer	"	"
	11. explain the "dot" convention for identifying primary and secondary polarity	"	"
Basic Meters	The student will learn the characteristics of AC and DC voltmeters and ammeters and ohmmeter, their proper use and methods for extending the range.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. list three precautions for connecting a DC or AC voltmeter in a circuit	I	S-PS
	2. list three precautions for connecting a DC ammeter in a circuit	"	"
	3. explain why meter polarity is important when measuring voltage or current in a DC circuit	"	"
	4. explain why a voltmeter is a high resistance device	"	"
	5. explain why an ammeter is a low resistance device	"	"
	6. describe the difference in construction of an AC voltmeter and a DC voltmeter	"	"
	7. list the most important rule when connecting an ohmmeter in a circuit to measure resistance	"	"
	8. explain why it is necessary to have an adjustable resistor within the ohmmeter	"	"
	9. identify if the scale of an ohmmeter is linear or non-linear	"	"
	10. describe how an ohmmeter should be stored	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Power Supplies	The student will learn the characteristics of a half-wave, full-wave and bridge rectifiers; types of filtering; calculating percentage of ripple; types of regulations; calculating voltage regulation; operation of half-wave and full-wave doubler circuits and their applications and troubleshooting techniques.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. describe a semiconductor and vacuum tube diodes	"	"
	2. explain and identify forward bias	"	"
	3. expalin and identify reverse bias	"	"
	4. explain why a rectifier is needed in a power supply for electronic circuits	"	"
	5. describe the purpose of the transformer, the diode and the resistor in the rectifier circuit	"	"
	6. draw the input and output waveforms of a half-wave, full-wave and bridge rectifier units	"	"
	7. identify the ripple frequency (in herz) of a full-wave rectifier circuit when the input frequency is 60 herz	"	"
	8. explain the operation of a half-wave, full-wave and bridge rectifier circuits	"	"
	9. list two disadvantages of a half-wave rectifier circuit	"	"
	10. list two advantages of a full-wave rectifier circuit in comparison to a half-wave rectifier circuit	"	"
	11. list one advantage of a bridge rectifier circuit over a full-wave rectifier circuit	"	"
	12. explain the purpose of a filter circuit	"	"
	13. describe briefly how a filter circuit (capacitor input) reduces the pulsations from a rectifier circuit	"	"
	14. define ripple voltage	"	"
	15. calculate the percentage ripple of output voltage from a power supply when given the output DC voltage and the RMS value of ripple voltage	"	S
	16. calculate the percent voltage regulation of a power supply when given full load and no load voltages	"	"

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Power Supplies (cont'd.)	17. identify a possible cause of a hum in the speaker of a hi-fi set	I	S
	18. describe the effect on output DC voltage over a varying load when a zener diode is connected across the output of a power supply	"	"
	19. describe the operation of a half-wave and a full-wave doubler circuit	"	S-PS
	20. list two advantages of a half-wave or a full-wave doubler circuit	"	S
	21. troubleshoot power supplies that have faults inserted	"	S-PS
	22. explain the operation of a series and/or shunt voltage regulators	"	PS
	23. explain the operation of the IC voltage regulator	"	"
	24. explain the operation of the short circuit and/or overload current protection	"	"
	25. explain the floating power supply	"	"
Resonance	The student will learn the characteristics of a series and parallel resonance circuits; calculating resonant frequency; calculating the half-power points (-3db voltage points); calculating the "Q" of the circuit and its effect on band width selectivity; and practical applications of resonant circuits	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. define resonant frequency	I	S
	2. explain why the voltage drop across an inductor is zero at 20 hz	"	"
	3. explain why the voltage drop across a capacitor is high or equivalent to source voltage at 20 hz	"	"
	4. describe the impedance characteristic of a series resonant circuit	"	S-PS
	5. describe the current characteristic of a series resonant circuit	"	"
	6. describe the impedance characteristic of a parallel resonant circuit	"	"
	7. describe the current characteristic of a parallel resonant circuit	"	"
	8. identify the formula for calculating resonant frequency of an RLC circuit	"	"
	9. calculate the resonant frequency of an LC circuit when given values of inductance and capacitance	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Resonance (cont'd.)	10. calculate the half-pwer point of a series and/or parallel resonant circuit	I	PS
	11. explain what is meant by the "Q" of a circuit	"	"
	12. calculate circuit "Q"	"	"
	13. explain how the "Q" of the circuit effects band width selectivity	"	"
	14. list at least three uses of a series resonant and a parallel resonant circuit	"	"
Couplings and Filters	The student will learn the characteristics, advantages and disadvantages of the various coupling circuits; the purpose and design of by-pass capacitors and/or couplings; and the characteristics and applications of low-pass, high-pass and band-pass circuits.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. list the three methods for transferring a signal from one stage of amplification to the next stage.	I	S-PS
	2. explain the two purposes of a coupling circuit	"	"
	3. describe how power is transferred from one circuit to another circuit by transformer action	"	"
	4. explain the difference between the primary and secondary windings of a transformer	"	S
	5. explain the effects of a steady and a changing magnetic field on tranformer action	"	"
	6. list three uses of a transformer as a coupling device in an electronic circuit	I	S-PS
	7. describe what happens to a signal that passes through an RC coupling when the capacitance of the coupling decreases in value (from .1 mfd to .002 mfd.)	"	"
	8. list two advantages of RC coupling	"	"
	9. list one disadvantage of EC coupling compared to transformer coupling	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Couplings and Filters (cont'd)	10. List one advantage of transformer coupling	I	S-PS
	11. List two disadvantages of transformer coupling	"	"
	12. List one advantage and disadvantage of direct coupling	"	"
	13. Describe what happens to frequency as it is decreased with RC coupling	"	"
	14. Describe what happens to frequency as it is increased with transformer coupling	"	"
	15. identify the 3 db drop of the low and high frequencies of an output signal that has a flat output response of 1 volt	"	"
	16. identify the size and type of capacitor normally used in RC coupling for an audio amplifier	"	"
	17. describe what happens to a low signal frequency (100 herz) as compared to a higher signal frequency (20,000 herz) when passed through an RC coupling of .002 mfd	"	"
	18. describe the purpose of a bypass capacitor	"	"
	19. describe the purpose of a low pass filter	"	"
	20. explain cutoff frequency	"	"
	21. describe what happens in a low pass filter circuit operation when the load resistance is decreased	"	"
	22. describe the purpose of a high pass filter	"	"
	23. identify what determines the range of frequencies passed in a high pass filter circuit	"	"
	24. describe a band pass filter circuit and its purpose	"	"
Test Equipment	The student will learn the operating characteristics and proper use of the volt-ohm-milliammeter (VOM), resistance-capacitor bridge (impedance bridge), oscilliscope, sine/square wave generator, signal generator, transistor checker and transistor curve tracer.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. describe a VOM	I	S-PS
	2. identify how the sensitivity of a voltmeter is specified	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Test Equipment (cont'd.)	3. describe how a voltmeter and an ammeter is connected in a circuit	I	S-PS
	4. explain why the power is removed from a circuit when measuring resistance	"	"
	5. identify if the internal resistance of a voltmeter is high or low as compared to the ammeter	"	"
	6. identify if the internal resistance of an ammeter is high or low as compared to a voltmeter	"	"
	7. describe the purpose of the zero ohm adjust know on the ohmmeter	"	"
	8. describe the purpose of an RC bridge	"	"
	9. describe the purpose of a null-indicator	"	"
	10. describe the purpose of an oscilloscope	"	"
	11. list the four main sections of an oscilloscope	"	"
	12. identify the type of voltage value read on the oscilloscope	"	"
	13. describe a sine/square wave generator	"	"
	14. describe an attenuator	"	"
	15. list three uses of a sine/square wave generator	"	S
	16. describe a signal generator	"	"
	17. identify the function of each knob and control on the signal generator when given a picture of a signal generator	"	"
	18. when given a VOM, a circuit with various components and a source of power, the student must be able to correctly measure voltage, current and resistance as specified	"	"
	19. when given a resistance-capacitance bridge and various capacitors, the student must be able to correctly read the capacitive value and leakage	"	"
	20. when given an oscilloscope, a sine/square wave generator and a circuit with various components, the student must be able to measure peak-to-peak voltage drops at specified frequencies across the various components	"	S-PS
	21. when given a signal generator, a VTVM, a 3 ohms precision resistor, and a speaker, the student must be able to correctly measure the impedance of of the speaker voice coil	"	S
	22. determine the accuracy of above test equipment	"	PS
	23. describe calibration and maintenance procedures for identified test equipment	"	PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Test Equipment (cont'd.)	24. explain what is meant by the probability of errors for identified test equipment	I	PS
Transistor Characteristics and Biasing	The student will learn the characteristics of a bi-polar, junction transistor; precautions used in working with transistors; current and voltage terms frequently used; relationship of base, emitter and collector currents; proper biasing for NPN and PNP transistors; the various bias stabilization circuits; transistor characteristic curves and load lines; and transistor equivalent circuits.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. identify the correct polarity of bias voltages for PNP and NPN transistors	I	S-PS
	2. name the precaution necessary for inserting and removing transistors from circuits	"	"
	3. name the precaution necessary when soldering transistor leads	"	"
	4. name the precaution necessary when taking voltage readings using a probe, at the base or collector of a transistor	"	"
	5. identify I_C, I_E, I_B, V_C, V_E, V_{CE}, V_{CC}, and V_{EE}	"	"
	6. identify the formula that expresses the relationship amongst I_E, I_C and I_B	"	"
	7. state the factor that is held constant when plotting the static collector characteristic curves	"	"
	8. name the two basic types of characteristic curves for a transistor	"	"
	9. name the set of curves that a load line is drawn on	"	"
	10. name the two circuit values that must be known before a load line can be plotted	"	"
	11. state approximately where on the load line the operating point is placed	"	"
	12. explain the purpose of transistor characteristic curves and load lines	"	"
	13. explain the purpose of biasing a transistor	"	"
	14. define negative temperature coefficient	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Transistor Characteristics and Biasing (cont'd.)	15. describe what is meant by Thermal runaway when applied to a transistor. Also, describe the results of the transistor when Thermal runaway takes place		
	16. explain what is meant by bias stabilization	I	S-PS
	17. list the three most popular methods for bias stabilization	"	"
	18. list three types of resistor stabilizing circuits	"	"
	19. state the name of the thermal resistor that behaves like a semi-conductor	"	"
	20. identify the words that are the contraction for the word "thermistor"	"	"
	21. draw the schematic symbol for a thermistor	"	"
	22. identify the name given for current gain of a transistor in a common-emitter circuit configuration	"	"
	23. describe the purpose of the by-pass capacitor in the emitter circuit	"	"
	24. draw the equivalent circuit for a given transistor	"	PS
	25. determine the input and output impedance of a given transistor	"	"
	26. calculate the voltage and current gains	"	"
	27. calculate the db voltage gain and power gain	"	"
Transistor Amplifiers	The student must learn to identify and draw the three basic configurations of transistor amplifiers; their characteristics; to apply and design a Class A, Class B, Class AB and Class C amplifiers, to analyze small signal and large signal amplifiers and their uses; to analyze by use of "h" parameters the characteristics of the three basic configurations; and to recognize and describe the operation of amplifier circuits, such as: darlington pair, single-ended and push-pull amplifiers, phase inverters, complementary symmetry amplifiers and impedance matching amplifiers.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. name the three basic configurations of transistor amplifiers	I	S-PS
	2. identify each of the three basic configurations of transistor amplifiers	"	"
	3. list the characteristics of a common-emitter, comon-base, common-collector transistor amplifiers as to: voltage gain, current gain, power gain, input and output impedances and phase relationship of input and output signals	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Transistor Amplifiers (cont'd.)	4. list at least one typical use for each of the three basic transistor circuit configurations	I	S-PS
	5. explain what is meant by Class A, Class B, Class AB and Class C amplifiers	"	"
	6. list at least one use for the above classes of amplifiers	"	"
	7. analyze the difference between the small signal and large signal amplifiers	"	PS
	8. draw equivalent circuits using "h" parameters for each of the three basic configurations of transistor amplifiers	"	"
	9. calculate voltage, current and power gains, input and output impedances, and phase relationship of input to output signals using "h" parameters	"	"
	10. draw the Darlington circuit from input to output	"	S-PS
	11. list three advantages of the Darlington circuit	"	"
	12. state the type of basic configuration the Darlington circuit represents and list the characteristics of the Darlington circuit in regard to: a. frequency response b. input and output impedances c. voltage gain d. current gain e. power gain f. phase relationship of input to output signal	"	"
	13. name the type of transistor normally used for Darlington circuit	"	"
	14. name a use for the Darlington circuit	"	"
	15. list and describe the differences between the two basic types of audio amplifiers, namely voltage and power amplifiers	"	"
	16. describe the operation of the single-ended power amplifier	"	"
	17. describe the operation of the push-pull pwoer amplifier	"	"
	18. calculate the voltage and power gains of the single-ended and push-pull amplifiers	"	"
	19. define a phase inverter	"	"
	20. describe one purpose for a phase inverter circuit	"	"
	21. list two other names for a phase inverter circuit	"	"
	22. list two basic types of circuits for phase inverting	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Transistor Amplifiers (Cont'd.)	23. identify which output signal is in-phase and which one is out-of-phase with the input signal for a transistor phase inverter	I	S-PS
	24. identify the phase relationship between the two output signals of a phase inverter	"	"
	25. list three disadvantages of a transformer phase inverter	"	"
	26. describe what is meant by complementary symmetry	"	"
	27. identify the basic type of operation for the complementary symmetry amplifier	"	"
	28. list at least two advantages of the complementary symmetry amplifier over the conventional push-pull amplifier circuit	"	"
	29. identify the two types of transistors used in the complementary symmetry amplifier	"	"
	30. identify essentially the type of circuit the complementary symmetry circuit represents, that is, a common-emitter, a common-base or a common-collector (emitter-follower)	"	"
	31. identify the impedance characteristics (input to output) of a complementary symmetry circuit	"	"
	32. identify the phase relationship and voltage gain of the complementary symmetry circuit	"	"
	33. state the purpose of an impedance matching amplifier	"	"
	34. list two uses of an impedance matching amplifier	"	"
	35. identify the basic type of amplifier configuration used for impedance matching	"	"
	36. list four characteristics of an emitter-follower circuit	"	"
	37. explain why the common-collector amplifier is called the emitter-follower circuit	"	"
Vacuum Tubes	The student must learn the characteristics and applications of vacuum tubes.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. identify the structural characteristics of the diode, triode, tetrode and pentode vacuum tubes and compare to equivalent semiconductors	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Vacuum Tubes (cont'd.)	2. explain and identify foward and reverse bias	I	S-PS
	3. identify the standard numbering system of vacuum tubes for approximate filament voltage	"	"
	4. identify the standard numbering system for quantity of useful elements connected to base pins	"	"
	5. identify the purpose of the letter or letters designation used in the standard numbering system used for vacuum tubes	"	"
	6. identify by the numbering system for pins by key or separate keyway	"	"
	7. plot vacuum tube characteristic curves	"	PS
	8. state the relationship between amplification factor, plate resistance and mutual conductance	"	"
	9. draw and explain the operation of the diode rectifier and triode amplifier	"	"
	10. draw the equivalent circuit for a vacuum tube	"	"
	11. calculate the voltage gain of an amplifier	"	"
	12. describe the various biasing used for vacuum tubes	"	"
	13. observe and explain the waveforms at different points of a single-stage vacuum tube amplifier circuit	"	"
	14. describe the applications of vacuum tubes in various configurations	"	"
Oscillators	The student will learn two broad classifications of oscillators, namely sinusoidal and nonsinusoidal oscillators. The student will learn the basic requirements for oscillations, identify the various oscillator circuits, explain the operation of each circuit and describe uses for these circuits.	T	S-PS
	When given a written test, the student myst be able to properly:		
	1. define oscillations	I	S-PS
	2. list the two broad categories of oscillators	"	"
	3. list four types of sinusoidal oscillator circuits	"	"
	4. list the three basic requirements for sustained oscillations	"	"
	5. state if an input signal is required for an oscillator to work	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Oscillators (cont'd.)	6. list three frequency determining devices	I	S-PS
	7. explain the difference between a sinusoidal and a nonsinusoidal oscillator	"	"
	8. identify the type of wave form characteristics of an LC oscillator	"	"
	9. state how oscillating frequency is determined by an LC circuit	"	"
	10. explain how the problem of damped oscillations are overcome	"	"
	11. explain what is meant by positive feedback	"	"
	12. identify another name for positive feedback	"	"
	13. name the type of oscillator that uses a center tapped inductor for feedback	"	"
	14. name a popular type of RC oscillator	"	"
	15. name the type of oscillator that is used when precise (very exact) frequency requirements are needed	"	"
	16. list two tyoes of an audio sine wave oscillator circuits	"	"
	17. list three types of an rf sine wave oscillator circuits	"	"
	18. name the type of oscillator that uses a split capacitor, that is, two capacitors with the center being the pivot point	"	"
	19. identify the output waveform of sweep oscillators	"	"
	20. state if the duty cycle of a blocking oscillator is normally high or low	"	"
	21. list one use of blocking oscillators	"	"
	22. draw a schematic of the Wien-bridge circuit	"	"
	23. explain the operation of a Wien-bridge oscillator circuit	"	"
	24. explain why negative feedback is used in the Wien-bridge oscillator circuit of this unit	"	"
	25. identify the part of the Wien-bridge oscillator that determines its output frequency	"	"
	26. calculate the center frequency when given the values of capacitance and resistance in a Wien-bridge circuit	"	"
	27. name two requirements for any circuit to oscillate	"	"
	28. define regeneration	"	"
	29. define degeneration	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Numbering Systems	The student will learn binary, octal and hexadecimal numbering systems; be able to convert back and forth from binary, octal, decimal and hexadecimal numbering systems; be able to use the radix complements and radix-minus-one complements of the above numbering systems for adding negative numbers.	T	S-PS
	When given a written test, you must be able to correctly:		
	1. describe why binary numbers are more suitable than decimal numbers for use with digital devices	I	S-PS
	2. write the base of the decimal and binary numbering systems	"	"
	3. state how many symbols are used in the decimal and binary numbering system	"	"
	4. describe for any numbering system what the position of a number corresponds to	"	"
	5. convert from a binary number to a decimal number	"	"
	6. convert from a decimal number to a binary number	"	"
	7. define the Octalnumbering system	"	"
	8. define the Octal Code	"	"
	9. convert binary numbers to Octal numbers	"	"
	10. convert Octal numbers to binary numbers	"	"
	11. list one advantage of grouping binary data in Octal Code	"	"
	12. define the hexadecimal code	"	"
	13. convert hexadecimal numbers to binary, octal and decimal numbers	"	"
	14. convert binary, octal, decimal to hexadecimal numbers	"	"
	15. list one advantage of the hexadecimal system	"	"
	16. define the redix complement or sometimes called the True Complement	"	"
	17. define the radix-minus-one complement	"	"
	18. perform subtraction by using the one's complement, the two's complement, the eight's complements and the seven's complement	"	"
Solid State Devices (Special)	The student will learn the characteristics and operation of some special diodes, namely: varactor, Shottky diode, tunnel diode, zener diode, P-I-N diode, and some special latching devices, namely: four-layer diodes, silicon		

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Solid State Devices (special) (cont'd.)	controlled rectifier, silicon control switch, diac, triac, and some special transistors, namely: unijunction transistor (including programmable UJT), junction field-effect transistor, metal-oxide semiconductor field-effect transistor and complementary MOS.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. draw and explain the characteristic curves for the following diodes:		
	a. varactor	I	PS
	b. Shottky diode	"	"
	c. tunnel diode	"	"
	d. zener diode	"	S-PS
	e. P-I-N diode	"	PS
	2. explain the operation of the following diodes:		
	a. varactor	I	S-PS
	b. Shottky diode	"	"
	c. tunnel diode	"	"
	d. zener diode	"	"
	3. list at least one common use of the above diodes	"	"
	4. explain the operation of the following latching devices:		
	a. four-layer diode (sometimes called PNPN or Shockley diode)	I	"
	b. silicon controlled rectifier (SCR)	"	"
	c. silicon controlled switch (SCS	"	PS
	d. DIAC	"	"
	e. TRIAC	"	"
	5. list at least one common use of the above latching devices	"	S-PS
	6. explain the operation of the following special transistors:		
	a. unijunctive transistor (UJT)	"	"
	b. junction filed-effect transistor (JFET)	"	"
	c. metal-oxide semiconductor field-effect transistor (MOSFET) and complementary MOS (CMOS)	"	"
	7. complare the characteristics of the vacuum tube to the JFET and MOSFET	"	6. PS
	8. analyze the JFET as a small signal amplifier	"	

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Solid State Devices (special) (cont'd.)	9. list the advanatages and disadvantages of various biasing for the JFET and MOSFET	I	PS
	10. explain the difference in construction of the JFET and MOSFET	"	S-PS
	11. explain the difference in current flow, power levels and cost between the bi-polar transistor and the JFET and/or MOSFET	"	PS
	12. list two applications of JFET and MOSFET in a digital circuit	"	"
	13. explain why it is so important to be careful when handling MOSFET's and CMOS	"	S-PS
Implementing Boolean Expressions with Logic Gates	The student will learn the six logic symbols, namely: AND, OR, Inverter, NAND, NOR and Exclusive OR, as to: their symbols, inputs/outputs, and respective truth tables for each. The student will also write the Boolean equation for a circuit using AND, OR, NAND, NOR and Inverter gates and when given any Boolean expression, will write a logic circuit for it. In addition, the student will draw an AND-OR logic network that corresponds to a truth table. The student will simplify a logical network from a Boolean expression by using the laws and identities of Boolean Algebra, by using Venn Diagrams, and by using Karnaugh Mapping. He/she will use DeMorgan's Theorem to convert AND/OR logic to NAND/NOR logic.	T	S-PS
	When given a written test, the student must be able to correctly:		
	1. state the number of conditions or "states" an electrical device normally has that are used in digital electronics	I	S-PS
	2. define binary	"	"
	3. identify the number-system that has only two ditis, namely) and 1	"	"
	4. define logic	"	"
	5. name two basic types of logic	"	"
	6. define a truth table	"	"
	7. state all possible combinations of inputs and outputs when given two, three or four binary inputs	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Implementing Boolean Expressions with Logic Gates (cont'd.)	8. draw a truth table for an OR gate and an AND gate when given two, three, or four binary inputs	I	S-PS
	9. draw the military standard symbol for an OR gate and an AND gate	"	"
	10. identify the type of circuit an OR gate is and the type of circuit an AND gate is	"	"
	11. draw the inverter symbol	"	"
	12. define the inverter relationship between a logical input and output	"	"
	13. list three other names for inverting	"	"
	14. write the complements of A, 0 and 1	"	"
	15. draw the standard military symbol for NAND gate	"	"
	16. draw and complete a truth table for A and B not ($\overline{A \cdot B}$) when given A and B as inputs for all binary combinations of A and B	"	"
	17. draw the standard military symbol for a NOR gate	"	"
	18. define a NAND gate	"	"
	19. define a NOR gate	"	"
	20. draw and complete a truth table for three input NOR gate	"	"
	21. write the mathematical notation of A or B not	"	"
	22. draw the symbol for the "Exclusive OR" gate	"	"
	23. define the "Exclusive OR" gate	"	"
	24. draw and complete a truth table for the input "Exclusive OR" gate	"	"
	25. list the three laws of Boolean Algebra	"	"
	26. identify the definition for each of the three laws of Boolean Algebra	"	"
	27. write the output or decision of any of the nine(9) identities of Boolean Algebra	"	"
	28. draw and complete a truth table for any of the nine (9) identities of Boolean Algebra	"	"
	29. identify the four (4) derived expressions of Boolean Algebra	"	"
	30. draw and complete a truth table for $A+\overline{A}B$ for all possible combinations of input A and B. Then do the same for A+B in proving that $A+\overline{A}B = A+B$	"	"
	31. develop and draw gating networks from Boolean expressions	"	"
	32. simplify logical expressions using Boolean algebra	"	"
	33. write DeMorgan's Theorem using the two mathematical expressions	"	"
	34. connect AND/OR logic into NAND logic	"	"
	35. identify a "Wired " AND or a "Wired" OR connection	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Implementing Boolean Expressions with Logic Gates (cont'd.)	36. list one advantage of a "Wired" AND or a "Wired" OR connection	I	S-PS
	37. simplify a Boolean expression using Venn Diagram or Karnaugh Mapping	"	PS
Flip-Flops and Its Application	The student must learn the characteristics of the RS Flip-Flop, T and RST Flip-Flop, D Flip-Flop and J-K Flip-Flop and their respective applications such as buffer register, shift register, three-state register, ripple counter, synchronous counter, ring counter, modulo counter, and up-down counters.	T	S-PS
	When given a written test, the student must be able to:		
	1. define flip-flop	I	S-PS
	2. define S-R flip-flop	"	"
	3. define steered flip-flop	"	"
	4. draw the symbol for an S-R flip-flop	"	"
	5. draw and complete a truth table for an S-R flip-flop, using High and Low for variable S and R	"	"
	6. identify the four rules pertaining to the "steered" flip-flop	"	"
	7. describe the operation of a steered flip-flop when given a logic symbol network for a steered flip-flop	"	"
	8. describe the operation of a T and RST flip-flop	"	"
	9. describe the operation of the D flip-flop	"	PS
	10. draw the symbol for the D flip-flop	"	"
	11. draw the J-K flip-flop symbol	"	S-PS
	12. describe the set-reset capability, of a J-K flip-flop when S is activated by a low and when R is activated by a low. Also when S and R are activated by a high	"	"
	13. describe the steering capability of a J-K flip-flop when J and K are high when J and K are low, and when J is high and K is low, and when J is low and K is high	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Flip-Flops and its Application (cont'd.)	14. describe what happens to a flip-flop in set condition (assume no J-K inputs) when a high trigger is applied and when a low trigger is applied		
	15. identify the number of flip-slops required for a "three-bit", a "four-bit", and a"five-bit" word length	I	S-PS
	16. define a register	"	"
	17. identify the maximum decimal number for a "three-bit", "four-bit", and "five-bit" registers	"	"
	18. write one purpose of a register	"	"
	19. describe what is meant by parallel transfer	"	"
	20. define most significant bit and least significant bit	"	"
	21. define what is meant by serial transfer	"	"
	22. describe what is meant by feedback and how it is used in the "A" and "B" register	"	"
	23. describe the operation of the three-state register	"	"
	24. describe the operation of the ripple counter	"	PS
	25. describe the operation of the synchronous counter	"	S-PS
	26. describe the operation of the ring counter	"	"
	27. describe the operation of the module counter	"	"
	28. describe the operation of the up-down counter	"	"
Decoders and Encoders	The student will learn the various code conversion, for example, encoding from decimal to binary or for decoding from binary to decimal. Examples of the various codes are 8-4-2-1 or BCD code, Excess-3 code, gray code, ASCII code, etc. In addition, the student will learn logic circuits for decoding binary information to perform certain operations within the computer.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. define the 8-4-2-1 code or BCD code	I	S-PS
	2. define the Excess-3 code	"	"
	3. define the gray code	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Decoders and Encoders (cont'd)	4. define the ASC II Code	I	S-PS
	5. define the term "reflective code"	"	"
	6. list the major use of the gray code	"	"
	7. connect gray code to binary	"	"
	8. convert binary to gray code	"	"
	9. name three chip's name of 7400 series will decode from BCD to decimal	"	PS
	10. define and explain the terms of multiplexer and demultiplexer	"	"
	11. explain the "code conversion"	"	S-PS
	12. define the terms "enabled" and "disabled"	"	"
	13. explain the difference between an encoder and a decoder	"	"
	14. design a logic circuit to convert from the excess-3 code to the 8421 code	"	PS
Radio Repair and Alignment	The student will develope knowledge and troubleshooting skills for servicing a typical A.M. or F.M. transistorized superheterodyne radio receiver.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. Identify the frequency spectrum of the A.M. and F.M. broadcast band.	I	S-PS
	2. List two disadvantages of the tuned radio frequency (TRF) radio receivers.	"	"
	3. Identify the normal range of audio frequencies.	"	"
	4. Define a superheterodyne radio receiver.	"	"
	5. Draw and label a block diagram of a superheterodyne radio receiver to include the following blocks:	"	"
	a. antenna	"	"
	b. r-f amplifier	"	"
	c. mixer	"	"
	d. local oscillator	"	"
	e. I-F amplifier	"	"
	f. detector	"	"
	g. automatic gain control (AGC)		

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Radio Repair and Alignment (cont'd)	h. audio drive	I	S-PS
	i. audio output	"	"
	j. speaker	"	"
	k. power supply	"	"
	6. Explain what is meant by the "sensitivity" of a radio receiver.	"	"
	7. Explain what is meant by the "selectivity" of a radio receiver.	"	"
	8. Describe the purpose of the r-f amplifier.	"	"
	9. Describe the purpose of the local oscillator.	"	"
	10. Identify by name when two frequencies are beated together.	"	"
	11. Identify the four signals produced in the mixer stage when given an r-f signal.	"	"
	12. Identify the intermediate frequency (I-F) for AM superheterodyne radio receivers.	"	"
	13. List the two functions of the detector stage.	"	"
	14. Describe the purpose of the automatic gain control (AGC) circuit.	"	"
	15. Describe the function of the audio driver stage.	"	"
	16. Describe the purpose of the audio output stage.	"	"
	17. Describe the purpose of the speaker.	"	"
	18. Describe the purpose of the power supply.	"	"
	19. Describe how a permanent magnet speaker operates.	"	"
	20. Label the parts of a speaker as shown in Fig. 29-1, page 158, in "Basic Electronics", by Zbar.	"	"
	21. List three methods of testing speakers.	"	"
	22. Explain how to measure the impedance of a PM speaker.	"	"
	23. List three general types of speakers.	"	"
	24. List two types of audio amplifiers you will normally encounter.	"	"
	25. List the four modes or classes of operation for amplifiers.	"	"
	26. Describe the output waveform as compared to the input waveform for each of the four modes of operation	"	"
	27. Identify the mode of operation for single-ended audio amplifiers and push-pull amplifiers.	"	"
	28. Identify which mode of operation is most efficient and which one is least efficient.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Radio Repair and Alignment (cont'd)	29. Describe how to measure the bandwidth of an amplifier and identify the low and high ends of the bandwidth.	I	S-PS
	30. Describe how to troubleshoot an amplifier by using a signal tracer or noise generator.	"	"
	31. Describe how to troubleshoot an amplifier using the quick-check method of clicks from the speaker.	"	"
	32. Describe how to troubleshoot an amplifier using the gain check method.	"	"
	33. Identify the method or methods of troubleshooting that is used once the trouble has been isolated to a stage within the amplifier.	"	"
	34. Describe the operation of a push-pull amplifier.	"	"
	35. Define the purpose of an IF amplifier.	"	"
	36. Identify the four frequencies that are the output of the converter.	"	"
	37. Identify the IF for a standard AM broadcast receiver.	"	"
	38. Identify the IF for an FM radio.	"	"
	39. Describe the characteristics that identify the IF amplifier.	"	"
	40. Identify the IF bandwidth.	"	"
	41. Describe why it is necessary to neutralize the IF amplifier stage in some receivers.	"	"
	42. Identify the component that fails and causes a common trouble of oscillations in the IF amplifier.	"	"
	43. Describe how an IF transformer in transistor radios are tuned..	"	"
	44. Describe the type of slug generally used in Japanese transistor radios (that is, a screw head or hex head) and whether it is single-tuned or dual-tuned.	"	"
	45. List the three functions of a detector stage.	"	"
	46. Describe the purpose of the AVC (automatic volume control)curcuit.	"	"
	47. Identify the most common electronic device used for detecting the audio signal.	"	"
	48. Describe a quick method for checking a possible defective AVC filter capacitor.	"	"
	49. Describe a method for checking the gain of IF amplifier stages.	"	"
	50. Identify the expected base-emitter voltage for a transistor that is operating properly.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Radio Repair and Alignment (cont'd)	51. List the three functions of the superheterodyne converter.	I	S-PS
	52. Explain the purpose of the mixer/oscillator section of the superheterodyne radio.	"	"
	53. Identify the frquency of the oscillator curcuit.	"	"
	54. List the four basic output frequencies of the converter stage.	"	"
	55. Identify the portion of the transistor characteristic curve that is used for mixing the two signals, that is, linear or non-linear portion of the curve.	"	"
	56. Describe a method for determining if the oscillator is working.	"	"
	57. Identify the proper bias for the converter transistor, that is, the base-emiter voltage.	"	"
	58. Describe what is meant by Tracking.	"	"
	59. Explain what is image frequency	"	"
	60. Describe briefly what is meant by receiver alignment.	"	"
	61. List the three sections that are aligned in a transistor AM superheterdyne receiver.	"	"
	62. Describe the procedure for aligning the IF section of the AM receiver.	"	"
	63. Identify a cause for the receiver to oscillate during IF alignment.	"	"
	64. Identify what the signal generator strength sould be when aligning the IF section.	"	"
	65. Identify the position of the volume control when aligning the IF section.	"	"
	66. Describe why the oscillator variable capacitor or coil is shorted when aligning the IF section.	"	"
	67. Describe the procedure for adjusting proper tracking of the local oscillator and RF input signal.	"	"
	68. Explain what is meant by tracking.		
	69. Identify at which end of the broadcast band that trimmer (small capacitors) adjustments are made.	"	"
	70. Identify at which end of the broadcast band that oscillator coil and antenna coil adjustments are made.	"	"
	71. Identify the normal bandwidth of a transistor AM and FM superhet IF section.	"	"
	72. List the steps in a logical approach to troubleshooting.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Radio Repair and Alignment (cont'd)	73. Identify possible faulty sections of an AM superhet radio when given a trouble.	I	S-PS
	74. Identify troubles associated with weak batteries.	"	"
	75. Describe how you would use your senses to locate a possible source of trouble.	"	"
	76. Explain why it is necessary to confirm a problem that was told to you about a faulty equipment.	"	"
	77. Identify faulty components when given voltage or resistance readings. within a stage.	"	"
	When given a performance test, you must be able to correctly identify the trouble in a superhet AM receiver within a reasonable time (established by the instructor). You will be furnished with a "bugged" AM superhet receiver and necessary test equipment.	I	S-PS
	Your grade for the above will be based on:		
	1. Logical approach to problem.	"	"
	2. Correct use of test equipment.	"	"
	3. Neatness.	"	"
	4. Time you took to isolate the problem.	"	"
	5. Summarizing to the instructor your reasons for taking the approach you did and how you were able to isolate the problem.	"	"
TV Repair and Alignment	The student will develope knowledge and troubleshooting skills for servicing black and white and color television receivers.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. Draw a block diagram of a typical black and white television receiver to include the following:	I	S-PS
	a. antenna	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
TV Repair and Alignment (cont'd)	b. r-f amplifier	I	S-PS
	c. mixer and oscillator	"	"
	d. video and sound IF amplifiers	"	"
	e. video detector	"	"
	f. automatic gain control	"	"
	g. video amplifiers	"	"
	h. 4.5 MHz Sound Amplifier	"	"
	i. FM detector	"	"
	j. Audio amplifier	"	"
	h. speaker	"	"
	l. image tube	"	"
	m. syne separator	"	"
	n. syne amplifier	"	"
	o. AFC system	"	"
	p. horizontal oscillator	"	"
	q. horizontal output amplifier	"	"
	r. horizontal deflection coils	"	"
	s. H.V. power supply	"	"
	t. L.V. power supply	"	"
	u. vertical oscillator	"	"
	v. vertical output amplifier	"	"
	w. vertical deflection coils	"	"
	2. Describe briefly the purpose of each of the above blocks.	"	"
	3. Draw a master black diagram of a color television receiver to include the following blocks:	"	"
	a. antenna	"	"
	b. R.F tuner	"	"
	c. video IF	"	"
	d. sound IF and Audio	"	"
	e. video detector and amplifier	"	"
	f. syne separators and AGC	"	"
	g. vertical and horizontal deflection and H.V.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
TV Repair and Alignment (cont'd)	h. color syne	I	S-PS
	i. chrominance circuits	"	"
	j. tri-color picture tube	"	"
	k. convergence system	"	"
	4. Describe briefly the purpose of each of the above blocks.	"	"
	5. Describe the following alignment procedures:	"	"
	a. video IF alignment	"	"
	b. sound IF alignment	"	"
	c. 4.5 mhz trap adjustment in the video section	"	"
	d. FM discrimimator or ratio detector in FM sound system.	"	"
	e. RF tuner alignment	"	"
	f. chrome alignment	"	"
	6. Describe the following adjustment procedures:	"	"
	a. color purity	"	"
	b. gray scale	"	"
	c. static-dynamic convergence	"	"
	When given a performance test, the student must be able to properly trouble-shoot and repair a black and white television receiver. He must localize eight of the following set of troubles:	I	S-PS
	a. No raster, sound present.	"	"
	b. Loss of vertical deflection.	"	"
	c. Blooming raster.	"	"
	d. White vertical lines or horizontal foldover.	"	"
	e. Vertical nonlinearity.	"	"
	f. Pie-crust effect.	"	"
	g. Keystoning.	"	"
	h. Insufficient width and height	"	"
	i. Vertical syne failures.	"	"
	j. Horizontal instability.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
TV Repair and Alignment (cont'd)	k. Weak or missing video.	I	S-PS
	l. Failures in low voltage power supply	"	"
	m. Sound failure.	"	"
	n. Video misalignment.	"	"
	Your grade for the above will be based on:		
	1. Logical approach to problem.	"	"
	2. Correct use of test equipment.	"	"
	3. Neatness.	"	"
	4. Time you took to isolate the problem.	"	"
	5. Summarizing to the instructor your reasons for taking the approach you did and how you were able to isolate the problem.	"	"
Multivibrator Circuits	The student will learn the characteristics, operation, applications, and design of the three basic multivibrator curcuits, namely, the astable, monostable and bistable multivibrator circuits, plus the Schmitt trigger circuit. In addition, he will learn to calculate the pulse recurrence frequency (PRF) and pulse width for the above circuits. He will learn to evaluate the waveforms at various points in the multivibrator and Schmitt trigger circuits.	T	S-PS
	When given a written test, the student must be able to properly:	I	S-PS
	1. List the three basic multivibrator circuits by their formal names.	"	"
	2. Provide the nicknames for the above in order.	"	"
	3. Identify which multivibrator does not require an external signal to operate.	"	"
	4. Identify the multivibrator that is used extensively in computers as counters or for storing binary information.	"	"
	5. Identify the multivibrator that has one stable state and a quasi-state (will return to its stable stage after a period of time).	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Multivibrator Circuits (cont'd)	6. Identify which multivibrators require an external signal to operate.	I	S-PS
	7. Identify the output waveform of multivibrators.	"	"
	8. Identify how many stable states a bistable multivibrator has.	"	"
	9. Describe how a schematic diagram of a multivibrator oscillator is normally recognized.	"	"
	10. Describe the operation of each of the three multivibrator circuits.	"	PS
	11. List at least two uses for the astable and monostable multivibrator.	"	S-PS
	12. Describe the operation of the Schmitt trigger curcuit.	"	PS
	13. List at least two uses of the Schmitt trigger circuit.	"	S-PS
	14. Calculate the currents and voltages of any of the three multivibrators and/or a Schmitt trigger when given circuit parameters.	"	PS
	15. Calculate the low and high trigger points when given circuit parameters of a Schmitt trigger circuit.	"	"
	16. Calculate the pulse recurrence frequency (PRF) and pulse width of an astable multivibrator when given circuit parameters.	"	"
Wave Shaping Circuits	The student will learn the characteristics of the various circuits used for waveshaping such as:	T	S-PS
	1. RC circuit as high pass or low pass filter with respect to sinusoidal, step-voltage, pulse, square wave, ramp, and exponential input signals as well as RL circuit used as high pass or low pass filters.	"	"
	2. Differentiator and integrator circuits.	"	"
	3. Series and parallel RLC peaking and ringing circuits.	"	"
	4. Diode clippers (positive and negative or combination of positive and negative) circuits.	"	"
	5. The peak rectifier circuit.	"	"
	6. The positive and negative clamper circuits.	"	"
	When given a written test, the student must be able to properly:		
	1. Define step, pulse, square wave, ramp and exponential waveforms.	I	S-PS

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UNIT OR SKILL TITLE		PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Wave Shaping Circuits (cont'd)	2.	Identify the RC high pass circuit.	I	S-PS
	3.	Identify the RC low pass circuit.	"	"
	4.	Identify the RL high pass circuit.	"	"
	5.	Identify the RL low pass circuit.	"	"
	6.	Analyze the response to step, pulse, square wave, ramp, and exponential waveforms to RC, RL and RLC circuits.	"	PS
	7.	Explain the differentiator circuit.	"	S-PS
	8.	Explain the integrator circuit.	"	"
	9.	Define the risk time and fall time.	"	"
	10.	Calculate the rise time.	"	"
	11.	Understand the result of time constant in comparison to the period of the input signal.	"	"
	12.	Use the integrator in analog computer application	"	PS
	13.	Define the critically damped, underdamped, and overdamped in RLC circuit.	"	"
	14.	Explain the difference between "peaking circuit" and "ring circuit".	"	"
	15.	Draw a simple diode clipping circuit.	"	S-PS
	16.	Draw a simple clampping circuit.	"	"
	17.	Draw a simple peak-detector circuit.	"	"
	18.	Explain the unique feature of the amplifier used as waveshaping.	"	"
	19.	Explain the effect of the amplifier gain control.	"	"
	20.	Explain the purpose of a limiter circuit.	"	"
	21.	Explain why a diode is ideally suited as a limiter.	"	"
	22.	List two ways a diode can be connected in a limiter circuit.	"	"
	23.	Define the rise or fall time of a pulse.	"	"
	24.	Define pulse duration.	"	"
	25.	Draw a schematic of a RC differentiator circuit showing the input square pulse and output wave form.	"	"
	26.	List a requirement of a differentiator in respect to time constant.	"	"
	27.	Calculate the size of the capacitor in a differentiator when given pulse width and size of the resistor.	"	"
	28.	List three uses of a differentiator.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Wave Shaping Circuits (cont'd)	29. Draw the sawtooth wave form and identify the rise and fall time of it.	I	S-PS
	30. Identify another name used for the sawtooth generator.	"	"
	31. Draw a simple schematic of a sawtooth generator using a neon lamp.	"	"
	32. Explain the operation of a sawtooth generator.	"	"
	33. Identify what-else could be used instead of a neon lamp for a sawtooth generator.	"	"
	34. Explain how the frequency can be varied in a sawtooth generator.	"	"
	35. List two practical uses of a sawtooth generator.		
Printed Circuit Boards	The student will learn the characteristics of printed circuit boards; precautions when installing or removing components to PC boards; proper solder methods; identifying and repairing hairline cracks; and proper layout and making PC boards.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. define a printed circuit board	I	S-PS
	2. define a module	"	"
	3. define discrete components	"	"
	4. define an integrated circuit (IC)	"	"
	5. explain the difference between a monolithic and hybrid integrated circuit	"	"
	6. identify an important precaution when removing or installing compoents on a printed circuit board	"	"
	7. list at least four rules when working with printed circuit boards	"	"
	8. identify type of solder recommended for printed circuit boards	"	"
	9. explain a proper method for soldering components to a printed circuit board	"	"
	10. explain two methods for identifying a hairline crack in a conductor of a printed circuit board	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Printed Circuit Boards (cont'd)	11. list two methods for repairing hairline cracks in a conductor of a circuit board 12. explain a method for making printed circuit boards.	I	S-PS
	When given a performance test, the student must be able to properly remove and install five components on a printed circuit board. The grade will be based on neatness and professional appearance of work plus using proper procedures.	I	S-PS
	When given a performance test, the student must properly layout a printed circuit when given a power supply; or amplifier, or oscillator schematic diagram. From this layout, he must construct a printed circuit board.	I	S-PS
	The student grade will be based on: a. neatness of work b. accuracy of work c. proper design procedures d. proper solder connections e. "does it work"	" " " " "	" " " " "
Integrated Circuits and its Application	The student will learn the two categaries of integrated circuits, namely the hybrid and the monolithic IC; the differences between SSI, MSI, LSI; and the characteristics of linear integrated circuits and the digital integrated circuits and their applications.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. define an integrated circuit 2. list the advantages of integrated circuits 3. list two types of integrated circuits, as classified by method of fabrication	I " "	S-PS " "

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UNIT OR SKILL TITLE		PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Integrated Circuits and its Application (cont'd)	4.	list the three standard packages of IC's	I	S-PS
	5.	explain how the pin numbers are identified on the dual-in-line package	"	"
	6.	list three characteristics of IC's	"	"
	7.	explain propogation delay	"	"
	8.	list four families of digital logic circuits	"	"
	9.	identify RTL, DTL, and TTL logic circuits	"	"
	10.	explain the terms: subtrate, epitaxial layer, depletion-layer, hybrid, monolithic, SSI, MSI, and LSI	"	"
	11.	describe briefly the differential amplifier	"	PS
	12.	describe briefly the operational amplifier	"	"
	13.	draw the circuit symbol for operational amplifier	"	S-PS
	14.	define the open loop voltage gain of an operational amplifier	"	PS
	15.	define the closed loop voltage gain of an operational amplifier	"	"
	16.	describe the characteristics of an operational amplifier	"	"
	17.	define the inverting input and non-inverting input	"	"
	18.	explain the voltage follower	"	"
	19.	calculate the voltage gain of the inverting amplifier and non-inverting amplifier	"	"
	20.	draw the circuit that uses the operational amplifier as integrator and differentiator	"	"
	21.	explain the terms such as slewing rate, input offset voltage, input offset current, common-mode rejection	"	"
	22.	name and explain three linear IC RF amplifiers	"	"
	23.	name and explain three linear IC audio amplifiers	"	"
	24.	name and explain three linear IC IF amplifiers	"	"
	25.	name three IC voltage regulators	"	"
	26.	explain the single-ended input/output and double-ended input/output for the differential amplifier	"	"
	27.	explain the basic phase-locked loop system	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Wire Wrapping	The student will develop knowledge and skills in wire wrapping techinques to include unwrapping.	T	S-PS
	When given a written test, the student must be able to properly:	I	S-PS
	1. Explain what wire wrapping is.	"	"
	2. Explain why wrapping is used.	"	"
	3. Identify the shape of the terminals used in wire wrapping.	"	"
	4. Explain why the wire wrapping terminals are shaped as they are.	"	"
	5. Identify the size of wire commonly used in wire wrapping.	"	"
	6. List two types of wire wrapped connections.	"	"
	7. List four advantages of wire wrapping.	"	"
	8. List the four operations in making solderless wire-wrapped connections.	"	"
	9. Identify a spiral wrap, an over-wrap and an open wrap.	"	"
	10. Identify how many turns of wrap is recommended.	"	"
	When given a performance test, the student must be able to properly wire-wrap a chip that will be provided to him and be able to test it to see if it is good or bad.	"	"
	The grade will be based on neatness of work and quality of the wire-wrap. Points will be taken off if the following conditions exist: a. over wrap b. spiral wrap c. open wrap d. insufficient turns e. pigtail	"	"
Central Processor Unit	The student will learn the function of arithmetic logic unit (ALU) and associated control unit.	T	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Central Processor Unit (cont'd)	When given a written test, the student must be able to properly:	I	S-PS
	1. Add binary numbers and check the answers by converting binary to decimal.	"	"
	2. Identify a gate that is called a quarter-adder.	"	"
	3. List the four rules of binary addition.	"	"
	4. Identify the inputs and outputs of a half-adder.	"	"
	5. Draw a logic network of a half-adder.	"	"
	6. Draw a block symbol of a half-adder.	"	"
	7. Explain the limitation of a haof-adder.	"	"
	8. Explain what a full-adder is capable of doing.	"	"
	9. Draw a block diagram of a full-adder with its three basic components.	"	"
	10. Draw the block symbol of a full-adder with inputs and outputs labeled.	"	"
	11. Draw the logic network for a full-adder.	"	PS
	12. List the essential components of the serial adder network.	"	S-PS
	13. Describe what the most significant bit represent when subtracting numbers.	"	"
	14. Describe how the 1's complement of a number is formed.	"	"
	15. Describe how the 2's complement of a number is formed.	"	"
	16. Convert positive and negative binary numbers (up to 15) to the 1's complement using 5 bits with the MSB as the sign bit.	"	"
	17. Convert positive and negative binary numbers (up to 15) to the 2's complement using 5 bits with the MSB as the sign bit.	"	"
	18. Perform subtraction of binary numbers (up to 15) using 1's complement.	"	"
	19. Perform subtraction of binary numbers (up to 15) using 2's complement.	"	"
	20. Multiply binary numbers by adding the multiplicand the number of times as given by the multiplier.	"	"
	21. Describe in general terms how multiplication by addition and counting down is performed.	"	"
	22. Explain why the B register be a shift around register when given a diagram of the multiplier network.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Central Processor Unit (cont'd)	23. Explain the purpose of the three input NAND gate (N8) when given a diagram of the multiplier network.	I	S-PS
	24. Divide binary numbers when given a dividend and a divisor.	"	"
	25. Explain in general terms how division by subtraction and counting-up is performed.	"	"
	26. Identify the section of a computer that performs the mathematics as accomplished in the experiment.	"	"
	27. Describe in general terms the multiplication by adding and shifting procedure.	"	"
	28. Multiply binary numbers by adding and shifting to left method.	"	"
	29. Draw and explain the logic network for a parallel adder	"	PS
	30. Trace and explain the code conversion of data entering the CPU when given a logic diagram.	"	"
	31. Distinguish the difference between the inclusiver "OR" and the exclusive "OR" gates.	"	S-PS
	32. Construct a half-adder when given a breadboard, appropriate chip, indicators, and power supply.	"	"
	33. Construct a full-adder when given the necessary equipment.	"	PS
	34. Construct an adder/subtractor when given DTL gates and necessary equipment.	"	"
	35. Construct a R-bit comparator using 7400 TTL chip (Quad, 2 input NAND Gate) and necessary equipment.	"	"
	36. Construct a R-bit comparator using 740R TTL chip (Quad, 2-input NOR gate) and necessary equipment.	"	"
	37. Describe the function of various registers such as: accumulator, memory address register, memory buffer register, etc.	"	S-PS
	38. Describe the timing sequence in a given minicomputer.	"	PS
	39. Describe the functions of timing.	"	"
	40. Read a timing flow diagram.	"	"
Memory Units	The student will learn the two different types of memory units, namely random access memories (RAMs) and read-only memories (ROMs), as	T	S-PS

CURRICULUM ARTICULATION

CLUSTER_____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Memory Units (cont'd)	well as the different forms to store data and instructions, such as magnetic cores, magnetic tapes, magnetic disks, magnetic drums, paper-punched tape, punched cards, semiconductor memory integrated circuits, etc.	T	S-PS
	When given a written test, the student must be able to properly:	I	S-PS
	1. Name two advantages and disadvantages of punched cards, magnetic core, C/MOS read/write, and PROM memory.	"	"
	2. Describe briefly how information is written into magnetic cores.	"	"
	3. Describe briefly how information is read from magnetic cores.	"	"
	4. Explain what is meant by "destructive" readout.	"	"
	5. Explain the difference between static and dynamic memory.	"	"
	6. Illustrate how magnetic cores are used to store binary information.	"	"
	7. Define the "switching time" of a magnetic core.	"	"
	8. Define the term "access time."	"	"
	9. Describe the function of the Memory Address Register.	"	"
	10. Describe the function of the memory buffer register.	"	"
	11. Define the term "memory cycle."	"	"
	12. Explain what is meant by coincident-current or half-select current.	"	"
	13. Connect components and core windings for a clear/write cycle when given the following core windings and components in block diagram:	"	"
	a. Memory Address Register	"	"
	b. Core driver	"	"
	c. Drive, inhibit, and sense windings	"	"
	d. Sense amplifier	"	"
	e. Inhibit driver	"	"
	f. Memory Buffer Register	"	"
	g. Control Circuit	"	"
	h. Timing chain	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Memory Units (cont'd)	14. Connect component and core windings for a read/restore cycle when given the following core windings and components in block diagram:	I	S-PS
	a. Memory Address Counter	"	"
	b. Core driver	"	"
	c. Drive, inhibit, and sense windings	"	"
	d. Sense amplifier	"	"
	e. Inhibit driver	"	"
	f. Memory Buffer Register	"	"
	g. Control circuit	"	"
	h. Timing chain	"	"
	15. Explain what happens and why when the read pulse is lost during a read/restore cycle.	"	"
	16. Explain what happens and why when the clear pulse is lost during a read/restore cycle.	"	"
	17. Explain what happens and why when the write pulse is lost during a read/restore cycle.	"	"
D/A and A/D Converters	The student will learn the operation of digital-to-analog (D/A) and analog-to-digital (A/D) conversions.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. Explain what is a digital-to-Analog converter.	I	S-PS
	2. Define digital signal.	"	"
	3. Define Analog signal.	"	"
	4. Explain why it is necessary to have a digital-to-analog converter.	"	"
	5. Calculate the output voltages of a given D/A converter.	"	"
	6. Draw a block diagram of a sophisticated D/A converter.	"	"
	7. Describe the purpose of the Level Amplifiers in a D/A converter.	"	"
	8. Describe the purpose of the operational amplifier in a D/A converter.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
D/A and A/D Converters (cont'd)	9. Explain why an analog-to-digital converter is used.	I	S-PS
	10. Provide another name for A/D converters.	"	"
	11. List two catagories of A/D converters.	"	"
	12. Identify a type of A/D converter used to digitize shaft rotation.	"	"
	13. Name the type of code used to digitize the shaft rotation.	"	"
	14. Draw a block diagram of a simple A/D converter and identify each of the three blocks.	"	"
	15. Explain how an A/D converter operates.	"	"
Minicomputer Programming For Technicians	The student will learn the minicomputer programming concept, flow-charting, data and instruction formating, machine language programming, and assembler language programming.	T	S-PS
	When given a written test, the student must be able to properly:	I	S-PS
	1. Explain the following terms:		
	a. accumulator	"	"
	b. link	"	"
	c. program counter	"	"
	d. instruction register	"	"
	e. major state generator	"	"
	f. memory buffer register	"	"
	g. memory address register	"	"
	2. Describe the three general types of computer instructions, namely input/output instructions, micro instructions, and memory reference instructions.	"	PS
	3. Explain what is meant by Mnemonic Coding.	"	S-PS
	4. Explain what is symbolic language.	"	"
	5. Explain what is machine language programming.	"	"
	6. Explain what is assembler language programming.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Minicomputer Programming For Technicians (cont'd)	7. Explain the "operation code" and "operand".	I	S-PS
	8. Explain the purpose of "current page", "0 page", and "indirect addressing" as part of the memory reference instruction (MRI).	"	PS
	9. Explain "autoindexing".	"	"
	10. Explain program branching.	"	S-PS
	11. Explain the purpose of the "RIM loader."	"	PS
	12. Explain the purpose of the "BIN loader."	"	"
	13. Describe the purpose of the "source program".	"	S-PS
	14. Describe "object program".	"	"
	15. Explain "subroutine".	"	"
	16. Explain "label".	"	PS
	17. Describe the two instructions, formats, namely MRI and Micro-instructions.	"	"
	18. Describe pseudo operators.	"	"
	When given a performance test, the student must be able to properly:	I	S-PS
	1. Write a simple machine language program.	"	"
	2. Write a simple assembler language program.	"	"
	3. Use the programmer's console to manually load and check a program.	"	"
	4. Use the ASR-33 teletype console to load and check a program.	"	"
	5. Use the paper punched tape to load and check a program.	"	"
Diagnostic Testing	The student will learn the techniques of using a logical approach to maintaining and troubleshooting a computer. He will develop a skill in using diagnostic programs for isolating troubles to a specific area.	T	S-PS
	When given a written test, the student must be able to properly:		
	1. List at least five initial checks to be taken in case of difficulty with computer operation.	I	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Diagnostic Testing (cont'd)	2. List two least reliable portions of a computer that can be readily checked.	I	S-PS
	3. List five thought processing questions a technician asks himself when analyzing computer difficulties.	"	"
	4. Identify a method that can be used if the program is short and simple for troubleshooting a computer problem.	"	"
	5. Identify the term used when the computer is used to help localize a problem with the computer.	"	"
	6. List two specific purposes a diagnostic program is generally used for.	"	"
	7. List five diagnostic programs that can be used to check computer operation.	"	"
	When given a performance test, the student must be able to properly:		
	1. Troubleshoot a faulty operation by:		
	a. displaying core and comparing with program sheet for short programs.	I	S-PS
	b. performing a dump and comparing with program sheet or format.	"	"
	c. checking program counter for proper start of program.	"	"
	d. checking control and switches for proper positions	"	"
	e. checking data values for proper entering.	"	"
	f. checking proper entry modes for supplying data to computer	"	"
	g. checking the validity of program.	"	"
	h. checking indicator lamp filaments for proper operation	"	"
	i. checking power supply for correct voltage levels	"	"
	j. analyzing a read-out pattern that will localize the trouble to a portion of the computer	"	"
	2. Use diagnostic programs to isolate the problem to an area.	"	"
	3. Once the problem is isolated, use a volthometer, or oscilloscope, or pulse generator, or logic probe, or a logic clip to "pin-point"	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Diagnostic Testing (cont'd)	the problem using manufacturer service literature such as logic diagrams, the theory of operation, the self-check procedures, and timing diagrams.	I	S-PS
FCC Rules	The student will learn the basic laws (elements 1 & 2) of the Federal Communication Commission (FCC) rules and regulations. In addition, he will learn tower marking and lighting, technical operation and remote pickup broadcast stations.	T	S-PS
	When given a written test, the student must be able to properly:	I	S-PS
	a. Identify where and how are FCC licenses and permits obtained.	"	"
	b. State who may apply for an FCC license.	"	"
	c. Describe what messages and signals may not be transmitted.	"	"
	d. State whether an operator amy deliberately interfere with any radio communications or signal.	"	"
	e. Identify type of communication that has top priority in the mobile service.	"	"
	f. List five reasons or grounds for suspension of operator license.	"	"
	g. Describe the penalties involved for violating a provision of the Communications Act of 1934 or a Rule of the FCC.	"	"
	h. Explain what is meant by "harmful interference".	"	"
	i. Explain what happens when an operator shouts into a microphone.	"	"
	j. Explain where an operator may find the specifications for obstruction marking and lighting (where required) for the antenna towers of a particular radio station.	"	"
	k. State who is responsible if an operator permits an unlicensed person to speak over his station.	"	"
	l. Identify the height above ground that determines if an antenna has to be painted.	"	"
	m. Identify the height above ground that determines if an antenna has to be lighted.	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
FCC Rules (cont'd)	n. Describe the inspection procedures for antenna lighting.	I	S-PS
	o. Explain how the operating power is determined by using the direct method.	"	"
	p. List the percentage above and below the licensed power that shall be maintained.	"	"
	q. Describe how antenna resistance and reactance is determined.	"	"
	r. List the low and high percentage of modulation that a station should maintain.	"	"
	s. Describe the power limitations for a licensed remote pickup broadcast station.	"	"
	t. List seven basic data that shall be recorded by the licensee of a remote pick-up broadcast base or mobile station in his required operating log.	"	"
	u. Identify the type of FCC license required to service and maintain a Citizen Band (CB) radio.	"	"

PROGRAM: ELECTRONICS

PREPARED BY: ROBERT REYNOLDS - FRANK WANG

SCHOOL: NASHUA HIGH SCHOOL - N.H.V.T.C. NASHUA

	OCCUPATIONAL /TITLES	O.E. No.	D.O.T. No.
SECONDARY	Electronic Assembler		726.781
	Radio Repairperson		720.281
	Public Address Sys. Ser.		822.281
	Sound Technician		829.281
	Communication Person		822.281
	Electronic Salesperson		828.251
	Office Mach. Repairer		633.281
	Typewriter Servicer		633.281
	Instrument Mechanic		710.281
	Electro-Mech. Tech.		710.281
	TV Repairperson		720.281
	Production Repairperson		729.281
	Tester Systems		729.381
	Electronic Technician		726.281
	Electronic Comm. Tech.		726.131
ARTICULATED	Radio Repairperson		720.281
	TV Repairperson		720.281
	Production Repairperson		729.281
	Tester Systems		729.381
	Electronic Technician		726.281
	Electronic Comm. Tech.		726.131
	Electron Salesperson		828.251
POST SECONDARY	Electronic Assem/Tester		729.381
	Color - Radio/TV Servs		720.381
	Radio Repairperson		720.281
	TV Sys. Repairperson		720.281
	Production Repairperson		729.281
	Test Technician		019.281
	Maintenance Technician		638.281
	Tester System		729.381
	Electronic Technician		726.281
	Mini Computer Tester		

UNIT OR SKILL TITLE

Safety Rules; Basic Tools; Schematic Symbols/Diagram; Soldering; Electrical Sources; Circuit Fundamentals; Color Codes; Component Identification; Ohm's Law/Application; Meter/Test Equipment; Inductor & Application; Capacitor & Application; Transformer & Application; Basic Meters; Power Supplies; Resonances; Coupling & Filtering; Test Equipment; Transistor Amplifier; Vacuum Tubes; Oscillators; Special Solid State Devices; Numbering Systems; Boolean Algebra; Flip-Flops & Application; Decoders & Encoders; Radio Repair & Application; TV Repair & Application; Multivibrator & Alignment; Basic Shop Use; Printed Circuits; Interf. Circuit Boards; Fiber Optics; Central Proc. Unit (CPU); W/A and A/D Converters; Memory Units; Microcomp. Progs./Techs.; Diagnostic Testing; ETC. Rules; Data Book x-Reference; Troubleshooting Techniques; Frequency Response; Calibration; Test Techniques; Pulse Circuitry; Intercoupling; Oscilloscope; Circuit Analysis; Microprocessor; Microcomputers

CODE:
R = REQUIRED
O = OPTIONAL

THE ARTICULATION OF SECONDARY AND POST-SECONDARY

VOCATIONAL EDUCATION PROGRAMS

VOCATIONAL SKILL AREA: HEALTH OCCUPATIONS EDUCATION

PARTICIPANTS: JUDITH MACULIEWICZ, STEVENS HIGH SCHOOL, CLAREMONT, NH
STAFF - NEW HAMPSHIRE VOCATIONAL-TECHNICAL COLLEGE, CLAREMONT, NH

WORKSHOP DATES: JUNE 27, 1977 - JULY 1, 1977
KEENE STATE COLLEGE, KEENE, NH

Activities supported by the N.H. State Department of Education - Vocational Technical Division under the authority of Section 553 of the Education Professions Development Act.

SECTION IV

HEALTH OCCUPATIONS - JOINT STATEMENT: SECONDARY AND POST-SECONDARY

Due to State and National licensure and creditation regulations of the various health occupations that must be met in most instances, a Health Occupations Education student on the secondary level will be prohibited from entering a particular Health Occupations program directly from high school with advanced standing. An example of this is the NHVTC Advanced Standing Policy - Nursing Program. The skills and knowledge a secondary student would possess could not receive credit for these directly out of high school until such time as the State and National Regulatory Boards examine their policies in relation to the secondary programs to bring about a consistency in the units of instruction and be approved by the various Boards.

(example attached)

11/75

NEW HAMPSHIRE VOCATIONAL-TECHNICAL COLLEGE

CLAREMONT

ADVANCED STANDING POLICY

TO BE ADMITTED WITH ADVANCED STANDING TO THE NURSING PROGRAM

THE APPLICANT MUST:

1. Submit an official application with a high school transcript or evidence of satisfactory equivalency certificate.

2. Transcripts and an evaluation report must be submitted by the applicant who has had previous nursing education in a state approved program and be recommended in writing by the director of the school.

3. Attend a personal interview.

4. Submit, upon acceptance, on an official college form a physician's report of satisfactory health.

5. Transfer of Credit: Students may transfer credits earned elsewhere to the nursing program. It is the students' responsibility to furnish the college with:
   (1) Transcripts of work completed elsewhere.
   (2) Catalogs from institutions attended with course descriptions for which transfer credit is sought. Generally, grades of "C" or better in courses equivalent in nature and content to the nursing program offerings will be accepted.

6. Credit by Examination: A student may challenge a course which she has had previously, by requesting and completing the examination which covers the instructional material of that course. Course outlines will be given the applicant prior to the examination for each course to challenged.

7. Clinical experience competencies will be evaluated by the nursing faculty.

8. A minimum of 50% credit must be earned at the college.

9. Notification of admissions decision will normally be sent within thirty days, by the Dean of Students, after all admission requirements have been met.

10. Placement in the nursing program will be determined after 5, 6, and 7 have been completed.

EXPLANATION OF OBJECTIVES AND CHART

The objectives and chart included in this package represent those health occupations which were identified as possible areas of articulation. In some areas, the units are identified rather than the specific skills, which were unavailable.

The objectives written are intended as terminal objectives, rather than interim, as will be noted in other curriculum clusters. It is the intent of the author (instructor) to make additions to the chart as objectives are formulated.

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Orientation to Health Care Occupations and Agencies	Given resource information about the health field, the student will demonstrate knowledge of many of the 200 health occupations available to him/her.	T	S
	List and describe ten health occupations of his/her choice and five duties of each.	I	S
	Submit a written research report of a health career, as specified by the instructor.	I	S
Employment in Health Occupations Education	The student, following classroom demonstrations and discussions will: 1) identify the common human characteristics that employers tend to look for in job applicants in the health field, to the instructor's satisfaction; 2) compare the kinds of skills people need to have before they can be hired, to the kinds of skills employers expect to be learned on the job according to instructor's directions; 3) demonstrate the fundamental techniques that employers use when interviewing job applicants to the instructor's direction; 4) demonstrate poise, articulateness, and confidence during a simulated job interview, to the instructor's satisfaction; 5) identify the skills they possess that may be saleable in their health community, to the instructor's specifications.	T	S
Medical Terminology I	Given a list of medical terms (including prefixes, roots, suffixes and abbreviations), and their definitions, the student will match the term with the correct definition with 95% accuracy.	T	S-PS
Anatomy and Physiology	Given reading assignments and classroom discussion, the student will be able to, with 90% accuracy, use correct medical terminology, in the following ten systems: Integumentary, Muscular, Skeletal, Digestive, Respiratory, Circulatory, Excretory, Reproductive, Nervous and Endocrine.	T	S-PS

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Anatomy and Physiology (cont'd)	Given reading assignments and classroom discussion, the student will, with 90% accuracy:		
	1. list major body systems;	I	S-PS
	2. define functions of each major body system;	I	S-PS
	3. describe structures in each major body system;	I	S-PS
	4. define the parts of a cell;	I	S-PS
	5. define tissue, organ and body system;	I	S-PS
	6. describe function of cells, tissues and organs;	I	S-PS
	7. write or state orally causes, symptoms, treatments and prevention of common illnesses, disorders and diseases.	I	S-PS
Introduction to Microbiology	Given reading assignments and classroom discussions, the student will demonstrate the fundamental aspects of microbiology.	T	S-PS
	Given reading assignments and classroom discussions, the student will identify and draw to the instructor's satisfaction:		
	A. 1. protozoa; 2. yeast; 3. molds; 4. bacilli; 5.parasites; 6. viruses	I	S-PS
	B. Describe in writing at least three methods of destruction;	I	S-PS
	C. List at least four diseases caused by harmful microorganisms;	I	S-PS
	D. Explain orally how disease-causing microorganisms are transmitted;	I	S-PS
	E. Describe in writing body defenses against common harmful microorganisms.	I	S-PS
Nutrition - Intro to Diet Therapy	Following textbook assignments and classroom discussions, the student will demonstrate to the instructor's satisfaction basic nutrition and the fundamentals of diet therapy.	T	S
	Follwing textbook assignments and classroom discussions, the student will:		
	1. list the basic four food groups;	I	S
	2. identify water-soluble and fat-soluble vitamins and minerals;	I	S
	3. write a one-day balanced diet for a fat-controlled, low salt, diabetic and a 1000calorie diet (see Health Care Skills for specific activities.)	I	S

cont'd.

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Nutrition - Intro to Diet Therapy (cont'd)	4. describe in writing how nutritional needs vary under specific disease conditions as related to the above diets, with 90% accuracy.	I	S
Interpersonal Communication	The student will demonstrate a beginning knowledge of Interpersonal Communications to the satisfaction of the instructor.	T	S
a. Ethics	The student will list eight personal qualifications that a health worker must strive to attain to be effective in working with and for people.	I	S
b. Telephone usage	The student will demonstrate correct telephone usage in a health facility to the instructor's satisfaction.	I	S-PS
c. Human behavior	Following textbook assignments and classroom discussions, the student will: 1. define and explain patterns of behavior as given by the instructor; 2. describe in writing how illness may affect a patient's behavior, to the instructor's satisfaction.	I	S
Developmental Psychology	The student will, to the instructor's satisfaction: 1. discuss the role of theory in developmental psychology with particular reference to the goals of psychology and all science; 2. describe the group of psychodynamic theories in terms of their view of conflict and its role in development; 3. name the two major classes of determinants that influence human development.	T	PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE NURSING FUNDAMENTALS I - (HEALTH CARE SKILLS)	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Medical Asepsis	Upon completion of this unit, the student will care for patients requiring medical asepsis by demonstrating correct handwashing techniques.	T	S-PS
	Each student will: 1. demonstrate correct handwashing technique as demonstrated by instructor, with 100% accuracy;	I	S-PS
	2. demonstrate the following with 95% accuracy using correct medical terminology: a. concurrent cleaning and disinfection of patient unit;	I	S-PS
	b. stripping and making up the cleaned unit;	I	S-PS
	3. take a written test with 90% accuracy.	I	S-PS
Equipment and Maintaining the Patient's Unit	Upon completion of this unit, the student will make beds that are neat, wrinkle-free and adapted to the needs of the patient; position beds appropriately; explain use of equipment for safety and comfort of the patient and using correct terminology when returning demonstrations.	T	S-PS
	Given necessary linens and supplies, each student will: 1. demonstrate with 100% accuracy, the making of a closed, open and occupied bed;	I	S-PS
	2. make bed adjustments for placing a patient in shock, semi-fowlers, and knee-gatch bed position;	I	S-PS
	3. explain purpose and position the following equipment on the bed: foot-board, bed rails;	I	S-PS
	4. take a written post-test.	I	S-PS
Positioning & Body Mechanics	Upon completion of this unit, the student will apply proper techniques in positioning, moving and transporting patients. The student will use proper personal body mechanics and maintain proper body alignment for the patient. The student will also use appropriate terminology and identify a list of equipment with its purpose(s).	T	S-PS

cont'd.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE NURSING FUNDAMENTALS I - (HEALTH CARE SKILLS)	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Positioning & Body Mechanics (cont'd.)	Using correct body mechanics and appropriate terminology, each student will demonstrate to the instructor's satisfaction:		
	1. lifting a patient in bed;	I	S-PS
	2. placing a patient in: dorsal, recumbant, prone, Sim's, Fowler's and Lithotomy position;	I	S-PS
	3. place patient in sitting, dangling and standing positions;	I	S-PS
	4. place patient in wheelchair;	I	S-PS
	5. move patient with assistance, from bed to stretcher and back to bed;	I	S-PS
	6. match with 90% accuracy, a list of equipment and its purpose(s).	I	S-PS
Patient Cleanliness	Upon completion of this unit, the student will give a complete bed bath, shower and assist patients with a partial bed bath, shower or tub bath. The student will assist the patient with good personal hygiene, skin care and management in prevention of decubiti.	T	S-PS
	Using proper safety measures, each student will demonstrate the following without error:		
	1. give a complete bedbath;	I	S-PS
	2. prepare and assist patient with partial bedbath;	I	S-PS
	3. prepare and assist patient taking a shower;	I	S-PS
	4. shave a male patient;	I	S-PS
	5. care for fingernails;	I	S-PS
	6. shampoo a bed patient;	I	S-PS
	7. comb hair;	I	S-PS
	8. give oral hygiene;	I	S-PS
	9. give a back rub;	I	S-PS
	10. give preventive decubitus care.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE NURSING FUNDAMENTALS I - (HEALTH CARE SKILLS)	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Vital Signs	Upon completion of this unit, the student will be able to take and record temperature, pulse, respiration, blood pressure, height and weight - using proper procedure, safety precaution and terminology. The student will score at least 90% on a written post test.	T	S-PS
	1. Each student will correctly demonstrate, with 100% accuracy:		
	a. taking 2 oral and 1 rectal temperatures and record on graphic sheet;	I	S-PS
	b. taking 2 radial pulses and respirations and record on graphic sheet;	I	S-PS
	c. taking an apical pulse;	I	S-PS
	d. caring for used thermometer;	I	S-PS
	e. using an aneroid and mercury sphygmomanometer, taking 2 blood pressures on each instrument to the satisfaction of the instructor;	I	S-PS
	f. using a clinical scale, take and record weight and height of 1 person.	I	S-PS
	2. Each student will write with 100% accuracy:		
	a. two safety factors to be followed when taking temperatures;	I	S-PS
	b. four pulse sites as given by the instructor.	I	S-PS
Body Elimination	Upon completion of this unit, the student will be able to assist the patient in the process of body elimination, collect and deliver lab specimens of urine, stool and sputum, perform a clinitest and acetest and record results, total I & O and record the results.	T	S-PS
	Each student will demonstrate according to the instructor's satisfaction:		
	a. perform two urine tests for sugar (clinitest) and acetone and record results with 100% accuracy;	I	S-PS
	b. assemble equipment, prepare patient and explain procedure for a s.s. enema;	I	S-PS
	c. total two oral intake and output sheets and records results with 98% accuracy;	I	S-PS
	d. write the following with 90% accuracy:		
	1. list conditions when a commode chair can be used;	I	S-PS
	2. list three kinds of enemas and give reasons for giving each.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE NURSING FUNDAMENTALS I - (HEALTH CARE SKILLS)	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Admission, Transfer and Discharge	Upon completion of this unit, the student will be able to assist with admission and discharge of patients and help the patient to adjust to the hospital environment.	T	S-PS
	Each student will demonstrate to the instructor's satisfaction: a. admitting a new patient;	I	S-PS
	b. assisting in transferring a patient to another unit;	I	S-PS
	c. discharging a patient.	I	S-PS
Ace Bandages and Elastic Stockings	Upon completion of this unit, the student will identify supplies and equipment and their application to the patient as demonstrated by instructor in class.	T	S-PS
	Given necessary supplies and materials, each student will ace bandage a foot and arm as demonstrated by instructor, with 90% accuracy.	I	S-PS
	Given necessary supplies, each student will apply an elastic stocking to a fellow student to the satisfaction of the instructor.	I	S-PS
Nutritional Needs	Upon completion of this unit, the student will record a patient's oral food and fluid intake and feed or assist in feeding patients.	T	S-PS
	Each student will demonstrate the following to the satisfaction of the instructor: a. prepare a patient for a meal by helping him/her wash hands and placing patient in a comfortable position;	I	S-PS
	b. feed or assist in feeding a patient;	I	S-PS
	c. report and record patient's oral fluid and solid intake;	I	S-PS
	d. check and report amount eaten to charge nurse when collecting trays.	I	S-PS

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CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE NURSING FUNDAMENTALS I - (HEALTH CARE SKILLS)	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Physical Examinations	Upon completion of this unit, the student will assist in the physical exam, prepare necessary equipment for PE and return any and all equipment to its proper place following sterilization or cleaning.	T	S-PS
	Each student will demonstrate to the instructor's satisfaction: a. draping the patient for physical examination using Sim's dorsal recumbant, lithotomy and prone positions;	I	S-PS
	b. explain verbally tje areas pf amatp,u tp be examined using the above positions;	I	S-PS
	c. identify orally, with 100% accuracy, the equipment used for a physical examination.	I	S-PS
Observing, Reporting and Recording	Upon completion of this unit, the student will report and record TPR, BP, WT, HT and other pertinent information on the patient's chart as demonstrated in class to the instructor's satisfaction.	T	S-PS
	Each student will chart with 100% accuracy: a. three TPR's, BP's, WT and HT;	I	S-PS
	b. subjective and objective symptoms as observed in a demonstrated simulation in class.	I	S-PS
Application of Heat and Cold	Upon completion of this unit, the student will prepare and administer heat and cold treatment as ordered.	T	S-PS
	Each student will demonstrate to the instructor's satisfaction: a. filling a hot water bottle;	I	S-PS
	b. filling an ice collar and applying to Chase doll;	I	S-PS
	c. prepare and assist a patient with a sitz bath;	I	S-PS
	d. prepare warm, wet soaks and apply to patient.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
	NURSING FUNDAMENTALS I -(HEALTH CARE SKILLS)		
First Aid and CPR	Upon completion of this unit, the student will demonstrate with 95% accuracy the objectives of the Red Cross Standard Multi-Media First Aid and CPR courses.	T	S-PS
	Each student will:		
	a. participate in and complete the 8-hour Standard Red Cross Multi-Media First Aid course and take a written final exam with 90% accuracy;	I	S-PS
	b. participate in and complete the 10-hour Red Cross CPR course and complete the practical exam with 95% accuracy.	I	S-PS
	NURSING FUNDAMENTALS II.		
	The student will, to the instructor's satisfaction:		
	a. perform procedures learned in PN 110 properly in the clinical area as demonstrated;		
	b. demonstrate and/or explain the rationale for steps in a procedure;		
	c. report promptly all significant changes in patient's condition to the proper person;		
	d. chart all pertinent information according to hospital policy;		
	e. adapt care to patient needs at a beginning level;		
	f. gain basic information about the patient's diagnosis and therapeutic action of treatment from available sources such as patient's chart, Kardex and reference books;		
	g. begin to establish effective interpersonal relationships by developing communication skills;		
	h. maintain a safe and therapeutic hospital environment;		
	i. assist in maintaining proper nutrition;		
	j. demonstrate professionalism while working in the clinical area;		
	k. practice proper medical and surgical asepsis and discuss principles underlying actions;		
	l. prepare and administer medication to a patient accurately, efficiently and safely;		
	m. assemble the equipment to be used, prepare the patient and assist both the physician and patient during examinations;		

cont'd.

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE NURSING FUNDAMENTALS II. (cont'd.)	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
	n. properly irrigate and instill medications into a body part or cavity; o. prepare and administer moist hot and cold compresses, packs and soaks; state the therapeutic and undesirable effects of heat and cold; p. prepare a patient for a surgical procedure; q. assemble the required equipment and assist with the care or the unconscious patient recovering from anesthesia and provide post-operative care to the patient fully recovered from anesthesia; r. assist with maintaining optimal urinary and bowel elimination;	T	PS
Health Technology	The student will, to the instructor's satisfaction: a. name the major factors which have influenced medical trends; b. identify ways that those trends relate to the development of the medical team concept; c. define common medical terms and accurately interpret all the abbreviations presented; d. define ethical behavior and be able to evaluate behavior as ethical or not ethical; e. recognize the importance of patients' rights; f. recognize and allpy first aid principles to common accidents and emergency situations; g. name potential hazards and list the safety measures for the protection of patients and personnel in a medical facility; h. define inflammation and name the cardinal signs and symptoms; i. identify the common signs and symptoms of the circulatory, gastro-intestinal, nervous, respiratory and urinary systems and skin; j. explain typical patient reactions to illness; k. list special considerations of patients during phases of medical treatment.	T	PS

PROGRAM: HEALTH OCCUPATIONS

PREPARED BY: J. MACULIEWICZ

SCHOOL: STEVENS HIGH SCHOOL

NURSING FUNDAMENTALS (HEALTH CARE SKILLS)

UNIT OR SKILL TITLE

	OCCUPATIONAL TITLES.	O.E. No.	D.O.T. No.	Medical Appendix	Equip/Maintain Pt. Unit	Patient Body Mechanics	Patient Cleanliness	Vital Signs	Daily Elimination	Unit/Transfer/Discharge	I & O	Therapeutic Communication	Observ./Report/Record	Complication - Nonfunction/Nursing	First Aid	CPR	Intro. to Microbiology	Nutrition/Diet	Medical Terminology	Orient. to Hosp. Plat Ther	Intro. to Health Careers I	Interpersonal Communicn.	Health Technology	Health Occ. I	Anatomy & Physiology I	Pharmacology	Developmental Psychology	Geriatrics	Nursing	Growth & Development	Medical Terminology	Medical Office Practice I	Medical Transcription I	Medical Office Practice II	Medical Transcription II	Accounting for the Med. Asst.
SECONDARY	Nurse Aid		355.878	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O					
	Respiratory Ther. Aide		079.368	R	O	R	O	R	R	O	O	R	O	R	O	R	R	R	R	R	O									O					
	Dietary Aide		317.887	R	O	R	R	O	R	O	O	O	R	O	R	O	R	R	R	R	R	O								O					
	Ward Clerk		219.338	R	R	R	O	R	R	R	O	O	O	O	R	O	R	R	R	R	R	O								O					
	Medical Assisting		079.368	R	R	R	R	R	R	R	R	O	R	R	O	R	R	R	R	R	R	O								O	O	O			
	Medical Lab Aide		072.368	R	O	R	O	R	R	O	O	O	O	R	O	R	R	R	R	R	R	O													
ARTICULATED	Nurse Aide		355.878	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O							O					
	Medical Assisting		079.368	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O							O	O	O		O	
SECONDARY POST	Practical Nursing		079.378	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R	R	R	R					
	Respiratory Ther. Asst.		079.368	R	O	R	O	R	R	O	O	R	O	O	R	O	R	R	R	O	R	R	R	R	R	R				R					
	Medical Records Tech.		100.388	R	O	R	O	O	O	O	O	O	O	R	O	R	R	R	R	O	R	R	R	R	R	R	R		R		R	R	R	R	R
	Occ. Ther. Assisting		079.368	R	O	R	O	R	R	O	R	O	O	R	O	O	R	R	R	O	R	R	R	R	R	R	R				R					
	Medical Assisting		078.368	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R	R	R	R	R				O		R	R	R	R
	Med. Lab Assisting		078.381	R	O	R	O	R	R	O	O	R	O	R	O	O	R	R	R	O	R	R	R	R	R	R	R				O					
	Med. Lab. Technician		078.381	R	O	R	O	R	R	O	O	O	O	R	O	R	R	R	R	O	R	R	R	R	R	R	R				O					
	Phys. Ther. Asst.		355.878	R	R	R	O	R	R	O	R	O	O	R	R	R	R	R	O	R	R	R	R	R	R	R	R				R					

CODE:
R = REQUIRED
O = OPTIONAL

THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

VOCATIONAL SKILL AREA: POWER MECHANICS

PARTICIPANTS: TIM PETERS, PLYMOUTH AREA HIGH SCHOOL
PLYMOUTH, NH

RON KOZIKOWSKI, NEW HAMPSHIRE VOCATIONAL TECHNICAL COLLEGE,
LACONIA, NH

WORKSHOP DATES: JUNE 27, 1977 - JULY 1, 1977
KEENE STATE COLLEGE, KEENE, NH

Activities supported by the N.H. State Department of Education, Vocational-Technical Division under the authority of Section 553 of the Education Professions Development Act.

EXPLANATION OF EMPHASIS AND DEPTH:
STUDY BETWEEN SECONDARY AND POST-SECONDARY INTERNAL COMBUSTION POWER SYSTEMS PROGRAMS

Utilizing the occupational job titles defined in the secondary and post-secondary programs, 13 job titles were identified as containing similar instructional units by the instructors at both levels. Of these 13 articulated job titles, instructors agreed that the most comprehensive job title commonly covered at both level was Auto Mechanic Apprentice. The required and optional skills for the other 12 articulated occupations are contained in the skill base of the Auto Mechanic Apprentice occupation.

Although this occupation can be reasonably articulated between the two specific school programs participating in the articulation process, the instructors at both levels agree that neither program provides 100% of the skill base required for employability in such a versatile occupation as Auto Mechanic Apprentice. This circumstance is not due to lack of acceptance of the total skill base required of the Auto Mechanic Apprentice, but rather the limitations of facilities, equipment and instructional time of the institutions the instructors represent.

The identification of the objectives for each skill associated with the Auto Mechanic Apprentice taught at both levels indicated that the depth and intensity of the theoretical aspects of the occupation was considerably greater at the post-secondary level. At the secondary level, because of the limited maturity, interest spans and academic-related skills of the students, it is both necessary and advantageous to put the emphasis on practical or hands-on skills.

Examples of depth of study

Post-Secondary: At the post-secondary level, a basic electricity course is taught the first term of the freshman year. This course is important because

it lays the foundation for other courses such as Charging Systems, Ignition Systems, Starting Systems and Advanced Engine Tune-up. If the student fails the first term basic electricity course, he or she cannot take succeeding courses that deal with electricity. It is during the first term that the student begins to understand the purpose and use of testing equipment, which from that time on is used constantly up through the senior year.

The depth ofstudy in electricity involves ignition analysis, using the engine scope, transistor ignition testing and service, fundamentals and operation of AC and DC generator regulators, testing AC and DC generators using test equipment, tracing circuits using wiring diagrams.

Secondary: Using the example of electricity, I, on the secondary level, will not emphasize the theoretical aspect of electrical systems as much as Ron (on the post-secondary level). I will "skim" theory, emphasizing function, common failures of units, and the removal and replacement of such units.

1.

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Safety	Each student, within the shop area, will demonstrate safe work habits to the satisfaction of the instructor.	T	S-PS
	Given instruction by demonstration and assigned homework on handtools and basic equipment, the student will demonstrate correct use of them, to the instructor's satisfaction.	I	S-PS
	Given instruction on the care and precaution of handling battery acid, the student will demonstrate his/her understanding to the standards set by OSHA.	I	S-PS
	Given instruction on keeping the work area clean and in order, the student will demonstrate by the performance on his/her projects, the correct standards as set forth by the industry.	I	S-PS
	Given the important factors and dangers of running engines indoors, the student will demonstrate in the lab, correct procedures to meet the standards of the instructor.	I	S-PS
General Information	Each student, within the shop, will demonstrate proper, safe and accurate use of handtools, power equipment, special tools, measuring tools and shop references, agreeable to the instructor's standards.	T	S-PS
	Given instruction on the correct procedure of repair manual usage, the student will demonstrate by written exam and lab performance that all projects have met manufacturer's specifications and instructor's standards.	I	S-PS
	Given instruction on how to order parts by serial number, model, year and type, the student will be given examples which must be looked up in the parts catalogs within a period of time established by the instructor.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
General Information (cont'd.)	Given instruction on how to use flat rate books for parts and labor charges, the student will, in writing, demonstrate that his/her estimates meet the instructor's satisfaction.	I	S-PS
	Given instruction on terminology, the student will demonstrate in writing and performance, the terms required by the instructor.	I	S-PS
	The student, given various math problems, will solve the problems with 90% accuracy.	I	S
	The student, given conversion factors and tables, will convert English readings to Metric, and the reverse, with 90% accuracy.	I	S
	The student, given a dial indicator, an inside micrometer, an outside micrometer, and a thickness gauge, will perform measurements with 90% accuracy.	I	S-PS
	The student, given a work order sheet and a vehicle requiring service, will write a work order to instructor's satisfaction.	I	S-PS
	Each student, given various fasteners, such as washers, nuts, bolts, screws, snap rings, circlips and keys will identify their size and use to instructor's satisfaction.	I	S-PS
	Each student, given the use of shop equipment, will demonstrate a positive attitude toward use, maintainance and organization of the equipment to instructor's satisfaction.	I	S-PS
	The student, given a soldering gun, solder, flux, wire, metal, clamps, will solder wires together and metal together, to the instructor's satisfaction.	I	S-PS
	The student, given metal, oxy-acytylene equipment and appropriate tools, will cut, weld, braze and heat to instructor's satisfaction.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Engine Disassembly	The student, given a vehicle in need of internal engine repair, will remove, and completely disassemble the engine, complying with manufacturer's and instructor's procedures.	T/I	S-PS
	The student, given an engine after instruction on how to disassemble and inspect, will display abilities to the standards set forth by the manufacturer.	T/I	S-PS
Parts Inspection Engine	The student, given a completely disassembled engine, will clean and visually inspect the parts, making a judgment as to the best procedure to be followed, complying with the instructor's judgment.	T	S-PS
	Given instruction on how to check for wear and damage of parts, the student will display his/her abilities to the standards set forth by the industry.	I	S-PS
	Given disassembled parts to be cleaned, the student will display in lab performance that he/she can clean parts to the satisfaction of the instructor.	I	S-PS
	Given instruction on how to operate the steam cleaner, cold parts washer, and carburetor cleaner, the student will demonstrate his/her ability to the standards set forth by the equipment manufacturers.	I	PS
	Given a set of pistons removed from an engine, and instruction, each student will inspect, indicate which pistons have cracks, worn grooves or lands, order and replace any pistons which do not pass inspection, as required by manufacturer's specifications.	I	S-PS
Engine Parts Measurement	The student, given a completely disassembled engine, will use the proper equipment, and references, to determine the amount of wear by measuring and comparing to manufacturer's specifications.	T	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Engine Parts Measurement (cont'd.)	Given instruction on how to check engine measurements, the student will demonstrate knowledge of the specifications set forth by the manufacturer.	I	S-PS
	Given instruction on the use of micrometers, feeler gauges and cylinder gauge, students will demonstrate their ability to meet the manufacturer's specification within a time period set by the instructor.	I	S-PS
	Given instruction on how to check a crankshaft for taper and out-of-round, the student, with a micrometer, will demonstrate the ability to see if the shaft is within manufacturer's specifications.	I	S-PS
	Given instruction on how to measure pistons for wear, the student will use tools necessary to check these in relationship to specifications set by the industry.	I	S-PS
	Given instruction on how to check piston pins for clearance, the student will display his/her ability to meet the specifications set by the manufacturer.	I	S-PS
	Given a situation where pistons are to be installed in an engine, the student will, with instruction, be able to check piston side clearance, ring end gap and groove clearances using appropriate measuring tools accurately to manufacturer's specifications and to the satisfaction of the instructor.	I	S-PS
Engine Rebuilding	The student, given a completely disassembled engine and proper replacement parts, will install new parts, agreeable with manufacturer's procedures.	T	S-PS
	Given instruction on how to remove the cylinder ridge with a ridge reamer, the student will demonstrate his/her ability by removal to the standards set by the industry.	I	S-PS
	Given instruction on how to bore or hone oversize, the student will demonstrate his/her ability to meet the oversize specifications set forth by the manufacturer.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Engine Rebuilding (cont'd)	Given a timing chain to replace, the student will demonstrate that he/she can install it with links and marks lined up to the specifications of the manufacturer.	I	S-PS
	Given instruction on how to check piston pin for clearance, the student, given pistons in the lab, will display his/her knowledge to the satisfaction of the instructor.	I	PS
	Given instruction and demonstration on how to grind valves and replace guides, the student will demonstrate in lab, the correct procedure as set forth by the manufacturer's specifications.	I	PS
	Given instruction on crankshaft splitting alignment and rod installation, the student will rebuild a crankshaft to the specification of the manufacturer.	I	PS
Engine Assembly	Given a completely disassembled engine, the student will, after instruction, completely assemble the engine to standards set by the the instructor and the manufacturer.	T	S-PS
	Each student, after receiving instruction, will be able to assemble engine parts in correct sequence using proper tools and manufacturer's specifications to the satisfaction of the instructor.	I	S-PS
	Given an engine which has been assembled, the student will install the engine accessories such as carburetor, air cleaner, starter-generator, etc. properly, and to the satisfaction of the instructor.	I	S-PS
	Given an engine which has been assembled and all accessories installed, the student will make pre-starting adjustments using proper tools and specifications to the satisfaction of the instructor.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Lubrication	Given a vehicle which must be lubricated and instruction, each student will select the correct lubricants according to manufacturer's specifications.	T	S-PS
	The student, given a vehicle in need of wheel bearing service will inspect, diagnose, repack or replace bearings and seals to manufacturer's specifications and instructor's standards.	I	S
	Given a vehicle in need of steering and suspension lubrication, the student will lubricate to manufacturer's specifications.	I	S
	The student, given a vehicle with manual steering, will check fluid level, fill to correct level and note any leakage according to manufacturer's specifications.	I	S
	The student, given a vehicle with a manual transmission and/or transfer case, will inspect for leakage and fluid level, lubricate linkage and service fluid levels, according to manufacturer's specifications.	I	S-PS
	The student, given a vehicle with an automatic transmission, will lubricate linkage, check and report leakage, and remove and replace fluid and filter, complying with manufacturer's specifications.	I	S-PS
	The student, given a vehicle, will inspect and lubricate speedometer cable to instructor's standards.	I	S-PS
	The student, given a vehicle, will inspect and report on universal joint and drive shaft condition, and lubricate universal joints, complying with instructor's standards and observations.	I	S-PS
	The student, given a vehicle with either rear, front or four-wheel drive, will inspect for leakage, fluid level, and report findings and fill the fluid to proper level in the differential assembly, in accordance with instructor's standards.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Cooling System	When given a vehicle in need of cooling and/or heating system service, the student will diagnose, acquire appropriate parts and perform the services required to restore 100% system efficiency within a time period deemed reasonable by the instructor.	T	S-PS
	The student, given a vehicle with a conventional cooling and heating system, will visually inspect and record the condition of all components, to comply with instructor's inspection.	I	S-PS
	The student, given a vehicle with a conventional heating and colling system, and appropriate test instruments, will test and report condition of all system components, to the satisfaction of the instructor.	I	S-PS
	The student, given a vehicle with a conventional heating and cooling system, will perform all periodic and/or seasonal maintainance, complying with instructor's standards.	I	S-PS
	Given an engine with an air-cooled engine and instruction, each student will inspect cylinder fins for debris and caked on dirt, or oil, then remove same using solvents, steam cleaner or wire brush, depending on encrustment, to the satisfaction of the instructor.	I	S-PS
	The student, given a vehicle with a defective cooling or heating component(s) will remove and replace the component(s), restoring the system to 100% efficiency.	I	S-PS
	Given a liquid-cooled engine, each student will diagnose engine cooling problem, repair, replace defective parts and test cooling system for proper working order, according to manufacturer's specification and the satisfaction of the instructor.	I	PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Exhaust System	Each student, given a vehicle and instruction, will inspect, list parts needed, order and install any new parts in the exhaust system with 100% no leaks, according to manufacturer's specifications.	T	S-PS
	The student, given a vehicle with a defective exhaust system, will list all components needing replacement and/or service, complying with state vehicle inspection and instructor's standards.	I	S-PS
	The student, given a vehicle with a defective exhaust system, will replace appropriate components and service the system to 100% no leaks and to instructor's standards.	I	S-PS
Electrical System	Given the basic principles of electricity, the student will demonstrate his/her knowledge of electricity by being able to read wiring diagrams and troubleshoot electrical problems by following standards set by the instructor.	T	S-PS
	Given a vehicle with a dead battery, jumper cables and a running vehicle, the student will safely hook up jumper cables and start vehicle with no damage to either vehicle.	I	S-PS
	The student, given a vehicle with a dead battery, and defective cables, will remove, diagnose, service or replace components so that battery will maintain voltage as specificed by manufacturer.	I	S-PS
	Given a wet-cell 6 or 12 volt battery, each student will, with instruction, inspect the general condition of the battery by testing and replace the battery if defective, according to manufacturer's specifications.	I	S-PS
	The student, given a vehicle with defective electrical accessories and frayed or broken wires, will diagnose, determine repairs needed, acquire parts and restore circuits to 100% efficiency.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Electrical System (cont'd.)	The student, given a vehicle with defective switches, lights and wiring, will inspect, diagnose and repair lighting system to meet state vehicle inspection.	I	S-PS
	The student, given a vehicle with inoperative gauges, will diagnose, repair or replace components to instructor's standards.	I	S-PS
Starting System	Given a vehicle with various defects in the starting system, the student will diagnose the problem(s), remove appropriate components, service and/or replace them to meet manufacturer's specifications and/or instructor's standards.	T	S-PS
	The student, given a vehicle with defective parts in the starter control circuit, will diagnose the problem, repair or replace components to restore system to manufacturer's specifications.	I	S-PS
	The student, given a vehicle with a defective solenoid or relay, will diagnose, service or replace the component to manufacturer's specifications.	I	S-PS
	The student, given a starter with a defective drive, will diagnose and replace drive to instructor's standards.	I	S-PS
	Given a vehicle with the starter removed, the student will report on the condition of the ring gear and be in agreement with the instructor's observation.	I	S-PS
	The student, given a vehicle with a defective starter, will diagnose problem, remove and disassemble starter, test all internal parts, replace parts and re-install to meet manufacturer's specifications for amperage draw on the starter.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Charging System	Given a malfunctioning electric generator or generator coil, the student will test operation of the generator circuit using proper tools and testers, order replacement parts if necessary, install new parts and test the charging system to specifications set by the manufacturer.	T	S-PS
	Given a vehicle, with worn or loose generator/alternator belt, the student will inspect, replace or tighten belt to manufacturer's specifications for tension.	I	S
	Given a vehicle with frayed, dirty or shorted charging system wiring, the student will inspect and repair or replace paets to achieve manufacturer's specifications on system output.	I	S-PS
	The student, given a vehicle with a false or non-reading ammeter or warning light, will diagnose problem, repair, replace or service parts to achieve an accurate reading.	I	S-PS
	The student, given a vehicle with a defective regulator, will diagnose problem and replace regulator to achieve manufacturer's specifications.	I	S-PS
	Given a malfunctioning electric generator or generator coil, each student will test operation of the generator, order replacement parts, install new parts and test operation of the repaired unit, according to manufacturer's specifications and to the satisfaction of the instructor.	I	PS
Ignition System	Given a vehicle in need of ignition system diagnosis and/or repair and appropriate ignition system test equipment, the student will diagnose, inspect, report on the system condition, service or replace parts needed and restore system to manufacturer's specifications and instructor's standards.	T	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Ignition System (cont'd.)	Given a nalfunctioning ignition system, each student will check contact points visually, test condenser, order replacement parts if necessary and install new points and condenser to the satisfaction of the instructor.	I	S-PS
	Given a malfunctioning ignition system, each student will test ignition coil, order a new coil if defective, and install new coil to the satisfaction of the instructor.	I	S-PS
	Given a set of spark plugs that need servicing, each student will inspect, clean and test each spark plug, order replacements and install to the satisfaction of the instructor.	I	S-PS
	Given a vehicle which won't start due to a defective resistor, the student will diagnose, test, clean or replace to allow the vehicle to start.	I	S-PS
	Given a vehicle with defective scondary ignition parts, the student will inspect, diagnose, repair or replace the cap, rotor or wires to meet instructor's standards.	I	S-PS
	Given a vehicle with defective primary wiring, the student will inspect, diagnose, repair or replace components necessary to meet instructor's standards.	I	S-PS
	Given a vehicle with a defective ignition switch, the student will diagnose, clean, remove and/or replace the part to meet manufacturer's specifications.	I	S-PS
	Given an engine which needs to have ignition timed, each student will, with previous instruction, use a timing light or static method to check and set timing to manufacturer's specifications.	I	S-PS
	Given a vehicle with a distributor problem, the studnet will inspect, diagnose, remove, acquire parts, rebuild and re-install the distributor to manufacturer's specifications.	I	PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Ignition System (cont'd.)	The student, given a vehicle with defective electronic ignition components, will diagnose, remove and replace components to meet instructor's standards.	I	PS
Fuel and Emission Control	The student, given a vehicle with a problem(s) in either the fuel system or emission control system, will diagnose, inspect and repair the system to manufacturer's specifications and Federal E.P.A. standards for that vehicle.	T	S-PS
	The student, given a vehicle with a defective fuel delivery system, will inspect, diagnose, remove and replace fuel pump and/or lines to meet manufacturer's pressure and volume specifications.	I	S-PS
	The student, given a vehicle with a cracked or leaking intake manifold, will inspect parts to restore efficiency to instructor's standards.	I	S-PS
	The student, given a vehicle with a defective fuel storage system, will inspect, diagnose, remove, repair and/or replace tank and/or mounts to instructor's standards.	I	S-PS
	Given instruction on a carburetor, the student will remove the unit, disassemble it completely, being careful to keep small parts together, and clean parts properly to the satisfaction of the instructor.	I	S-PS
	Given a carburetor that has been disassembled, the student will inspect the parts before assembly, order a replacement parts kit if necessary, install parts kit, adjust float level and metering jet rods using manufacturer's specifications to bring the carburetor to like-new operating condition.	I	S-PS
	Given a situation where the throttle linkage or cable is not operating properly or carburetor throttle plate or slide is not opening completely at full throttle, the student will adjust or order replacement parts to remedy the problem to bring throttle back to 100% perfect operation.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Fuel and Emission Control (cont'd)	Each student, given a carburetor with an inoperative or malfunctioning choke, will adjust or order replacement parts, install the new parts and set choke to manufacturer's specifications to bring choke to 100% perfect operation.	I	S-PS
	Given a multiple carburetor set-up, the student will describe the procedure required to balance the set-up to manufacturer's specifications.	I	S-PS
	Given a dirty or defective P.C.V. system on a vehicle, the student will inspect, diagnose, repair or replace components to meet manufacturer's specifications for the system.	I	S-PS
	The student, given a vehicle with a defective or misadjusted fuel sender unit, will remove, adjust, or replace the unit to meet instructor's standards.	I	S-PS
	The student, given a vehicle with a improperly working heated air system, will inspect, diagnose, adjust and/or replace components to achieve manufacturer's specifications for the system.	I	S-PS
	The student, given a vehicle with a defective A.I.R. system, will inspect, diagnose, remove, rebuild or replace components to meet manufacturer's specifications for the system.	I	S-PS
	The student, given a vehicle with a defective Fuel Evaporation System, will inspect, diagnose, remove and/or replace components to restore system to manufacturer's specifications.	I	S-PS
	The student, given a vehicle with a defective E.G.R. system, will inspect, diagnose, remove and/or replace components to restore system to manufacturer's specifications.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Clutch	Given a vehicle with a malfunctioning clutch, each student will, with previous instruction, remove clutch parts, clean, check for wear, replace worn parts, assemble and install unit to manufacturer's specifications and roadtest.	T	PS
	The student, given a vehicle in need of clutch adjustment, will inspect condition and operation, adjust and lubricate linkage to manufacturer's specifications.	I	S-PS
	Given a vehicle with a malfunctioning clutch, each student will remove clutch parts, clean, check for wear, replace worn parts, assemble and install unit and test for 100% perfect operation.	I	PS
Transmission	Given an automatic or standard transmission, each student will remove the unit diagnose the problem, order necessary replacement parts, install the new parts according to manufacturer's specifications, install the unit and roadtest.	T	S-PS
	The student, given a vehicle, will inspect, remove and replace transmission and/or motor mounts to meet instructor's standards.	I	S-PS
	The student, given a vehicle with a manual transmission and/or transfer case, will inspect for leakage and fluid level, lubricate linkage and service fluid levels to manufacturer's specifications.	I	S-PS
	The student, given a vehicle with an automatic transmission, will lubricate linkage, check and report leakage, and remove and replace fluid and fitter complying with manufacturer's specifications.	I	S-PS
	The student, given a vehicle, will inspect and lubricate speedometer cable to instructor's standards.	I	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
Transmission (cont'd.)	Given an automatic or standard transmission, each student will, after previous instruction, select correct tools and equipment, diagnose malfunction, disassemble, clean, check for worn parts, order replacement parts, assemble all parts to manufacturer's specifications, install transmission and roadtest.	I	PS

PROGRAM: POWER MECHANICS

PREPARED BY: TIM PETERS - RON KOZIKOWSKI

SCHOOL: PLYMOUTH AREA HIGH SCHOOL - N.H.V.T.C. LACONIA

	OCCUPATIONAL / TITLES	O.E. No.	D.O.T. No.	Safety	General Information	Engine Disassembly	Engine Parts Inspection	Engine Measurement	Engine Rebuilding	Lubrication	Cooling System	Exhaust System	Electrical System	Starting System	Ignition System	Fuel System	Clutch	Transmission	Final Drive	Steering System	Suspension System	Brake Service	Transmissions	Chassis Lubrication & Cutter Bar	Air Conditioning Service
SECONDARY	Muffler Installer	17.0303	807.884	R	R	O	O	O	O	O	O	O	R	O	O	O	O	O	O	O	O	O	O	O	O
	Auto Svc. Station Att.	17.0302	915.817	R	R	O	O	O	O	O	R	O	R	R	O	O	R	R	O	O	R	R	R	O	R
	Garageperson-Industrial		915.884	R	R	O	O	O	O	O	R	R	R	R	O	O	O	O	O	O	O	O	O	O	O
	Lubrication Person		915.887	R	R	O	O	O	O	O	R	R	R	O	O	O	R	O	O	O	R	R	O	O	O
	Electrician's Helper		729.884	R	R	O	O	O	O	O	R	O	O	R	R	R	R	R	O	O	O	O	O	O	O
	Carburetion Mechanic	17.0303	620.281	R	R	O	O	R	O	O	O	O	O	R	O	O	R	O	O	O	O	O	O	O	O
	Genrtr/Str Repairperson	17.0303	721.281	R	R	O	O	O	O	O	O	O	O	R	R	R	O	O	O	O	O	O	O	O	O
	Tune-Up Person	17.0303	625.281	R	R	O	O	R	O	C	R	R	R	R	R	R	R	O	O	O	O	O	O	O	O
	Automotive Electrician	17.0303	825.281	R	R	O	O	R	O	O	R	O	O	R	R	R	R	R	O	O	O	O	O	O	R
	Outboard Motor Mechanic	17.22	623.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	R	O
	Power Saw Mechanic	17.31	625.281	R	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R	O	O	O	R	O	R
	Motorcycle Repairperson	17.31	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	O
	Automechanic Apprentice	17.0302	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	R
ARTICULATED	Electrician's Help.-Auto		729.884	R	R	O	O	O	O	O	O	O	O	O	R	R	R	O	O	O				O	
	Outbd. Mot. Mech. Helper	17.22	623.884	R	R	R	R	O	O	R	R	R	R	R	O	R	R	O	O					O	
	Small Engine Mechanic	17.31	625.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O					O	
	Lawn Mower Mechanic		625.281	R	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R					R	
	Carburetion Mechanic	17.0303	620.281	R	R	O	O	R	O	O	O	O	O	R	O	C	R	R	O					O	
	Genrtr/Str Repairperson	17.0303	721.281	R	R	O	C	O	O	O	O	O	O	R	R	R	R	O	O					O	
	Tune-Up Person	17.0303	625.281	R	R	O	O	R	C	O	P	R	R	R	R	R	R	O						O	
	Power Saw Mechanic	17.31	625.281	R	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R					R	
	Garden Tractor Repairer			R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R					R	
	Snowmobile Repairer			R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R					O	
	Motorscooter Repairer	17.31	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R					O	
	Motorcycle Repairer	17.31	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R					O	
	Auto Mechanic Apprentice	17.0302	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R					O	
POST SECONDARY	Small Engine Mechanic	17.31	625.281	R	R	R	R	R	R	R	R	R	R	O	R	R	O	O	O	O	C	O	O	O	O
	Lawn Mower Mechanic	17.31	625.281	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R	R	R	R	R	O	O	O
	Outbd. Mot. Mech. Help.		623.884	R	R	R	R	O	R	R	R	R	R	R	R	R	O	R	R	O	R	O	R	O	R
	Power Saw Mechanic	17.31	625.281	R	R	R	R	R	R	R	R	R	R	R	O	R	R	R	O	O	R	O	R	O	
	Stern Drive Repairer			R	R	O	O	O	O	R	R	O	O	O	O	R	R	R	O	O	R	O	O		
	Motorscooter Repairer	17.31	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	O	
	Garden Tractor Repairer			R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	R	O	
	Snowmobile Repairer			R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	R	R	O	O	O		
	Outbd. Motor Repairer	17.22	625.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	R	O	O
	Motorcycle Repairer	17.31	620.281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	O	

CODE:
R = REQUIRED
O = OPTIONAL

THE ARTICULATION OF SECONDARY AND POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS

VOCATIONAL SKILL AREA: INDUSTRIAL WELDING

PARTICIPANTS: MR. EDWARD LANGLOIS, BERLIN HIGH SCHOOL
BERLIN, N.H.

MR. MEL CIULLA, NEW HAMPSHIRE VOCATIONAL-TECHNICAL COLLEGE
MANCHESTER, N.H.

WORKSHOP DATES: JUNE 27, 1977 - JULY 1, 1977
KEENE STATE COLLEGE, KEENE, N.H.

Activities supported by the N.H. State Department of Education, Vocational-Technical Division under the authority of Section 553 of the Education Professions Development Act.

LIST OF ABBREVIATIONS

A.W.S. - American Welding Society

S.M.A.W. - Shielded Metal Arc Welding

O.F.C. - Oxygen-Fuel Cutting

O.F.W. - Oxygen-Fuel Welding

G.T.A.W. - Gas Tungsten Arc Welding

G.T.A.W.-P. - Gas Tungsten Arc Pulsed Arc Welding

G.M.A.W. - Gas Metal Arc Welding

S.A.W. - Submerged Arc Welding

T.B. - Torch Brazing

R.S.W. - Resistance Spot Welding

O.A.C. - Oxygen Arc Cutting

O.L.C. - Oxygen Lance Cutting

P.O.C - Metal Power Cutting

A.A.C. - Air Carbon-Arc Cutting

C.A.C. - Carbon Arc Cutting

M.A.C. - Metal Arc Cutting

P.A.C. - Plasma Arc Cutting

T.S. - Torch Soldering

C.F.D. - Cubic Foot Displacement

D.C. - Direct Current

A.C. - Alternating Current

D.C.S.P. - Direct Current Straight Polarity

D.C.R.P. - Direct Current Reverse Polarity

M.S.P. - Mild Steel Plate

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
SHOP SAFETY AND ORIENTATION	Given instructions and text assignments the student will describe the operation and safety practices of all hand tools and power equipment related to welding skills. Also identify the hazards with arc welding, cutting, equipment, oxy-fuel, welding, cutting, equipment.	T	S-PS
	Describe all hazards associated with:	I	S-PS
	A. Arc Welding and cutting	"	"
	1. protective clothing	"	"
	2. eye protection and ear protection	"	"
	3. skin protection from ultra violet, infared rays	"	"
	4. burn care	"	"
	B. Equipment (Arc)	"	"
	1. welding machine safety	"	"
	2. welding lead safety	"	"
	3. shock	"	"
	C. Oxy-fuel welding and cutting	"	"
	1. protective clothing	"	"
	2. eye protection	"	"
	3. burn care	"	"
	4. safety of all gases available in shop	"	"
	5. location and proper use of fire extinguishers	"	"
	D. Equipment (oxy-fuel)	"	"
	1. safety of oxygen equipment	"	"
	2. safety of fuel gas equipment	"	"
	3. safety of manifold equipment both oxygen and fuel gas	"	"
	To the instructor's satisfaction.		
IDENTIFY AND USE TOOLS	Given a picture or teacher display of any hand or power tool in the welding shop, the student will identify with 100% accuracy each tool when requested.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER_____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
IDENTIFY AND USE TOOLS (cont'd)	Each student will be able to: repair, sharpen, adjust, any hand tool or power tool.	I	S-PS
	At the completion of this course, each student will be able to: identify, repair, sharpen, adjust, and hand tool, power tool, related welding area.	T	"
SET-UP EQUIPMENT	Each student will be able to set-up with 100% accuracy: S.M.A.W., O.F.C., O.F.W., G.T.A.W., G.T.A.W.-P., G.M.A.W., S.A.W., T.B., R.S.W., A.O.C., L.O.C., P.O.C., A.A.C., C.A.C., M.A.C., P.A.C., T.S.	I	S-PS
	At the completion of this course each student will be able to set-up with 100 % accuracy: S.M.A.W., O.F.C., O.F.W., G.T.A.W.-P., G.M.A.W., S.A.W., T.B., R.S.W., A.O.C., L.O.C., P.O.C., A.A.C., C.A.C., M.A.C., P.A.C., T.S., all equipment used in the welding shop.	T	S-PS
SCALES AND MEASUREMENTS	At the completion of this course each student will be able to: draw an item to scale, be able to take measurement from a scaled drawing and fabricate an item.	T	S
	Each student will be able to (only "Post Secondary" use drafting equipment) draw an item to scale, be able to take measurements from a scaled drawing and fabricate an item.	I	S-PS
	At the completion of this course, each student will be able to: use drafting equipment, read measurements on a blueprint, to the instructor's satisfaction.	T	PS
DEFINITIONS	Each student will understand all definitions related to his occupational-title.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
DEFINITIONS (cont'd)	Each student will know all definition, and understand their meaning.	I	S-PS
	At the completion of this course the student will: know all definitions, understand their meaning, to the instructor's satisfaction.	T	"
ABBREVIATIONS	Each student will be able to, with 100% accuracy, identify the A.W.S., (American Welding Society) Letter Designations and Welding Jargon.	I	S-PS
	At the completion of this course each student will be able to identify to the instructor's satisfaction the A.W.S. Letter Designation and Welding Jargon.	T	S-PS
BLUEPRINTS	At the completion of this course, each student will be able to interpret a series of Blueprints and instructions of the welding symbols. The student will identify object and wleding symbols, determining fabrication process, machine and equipment setting, according to all Blueprint specifications.	T	S-PS
	Given a Blueprint, the student will identify the object with 100% efficiency.	I	S-PS
	Given a Blueprint, the student will identify definitions, abbreviations, basic lines, welding symbols, scale and measurements to the instructor's satisfaction.	I	S-PS
	Given a Blueprint, the student will be able to determine materials to be used, proper electrodes and equipment to be used with 100% efficiency.	I	S-PS
FABRICATION	At the completion of this course the student will be able to read a Blueprint and assemble the fabrication by tacking the pieces together.	T	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
FABRICATION (cont'd)	Given a Blueprint, the student will be able to lay-out, position, aline, weld components together according to Blueprint specifications.	I	S-PS
	Each student will be able to:		
	1. Draw a project utilizing good drafting techinques and welding symbols, (there must be at least three different materials used.	I	S-PS
	2. Do an estimate to the product consisting of:	"	"
	a. materials and cost	"	"
	b. layout time	"	"
	c. cut out time	"	"
	d. assembly time	"	"
	e. helper time	"	"
	3. Do all locating and ordering of materials	"	"
	4. Lay out, cut out and assemble the project.	"	"
	5. Draw a project that utilizes gigs and fixtures to construct the assigned projects.	"	"
	6. Do an estimate for the project consisting of:	"	"
	a. materials and cost	"	"
	b. supplies and cost	"	"
	c. lay out time	"	"
	d. cut out time	"	"
	e. assembly time	"	"
	f. helper time	"	"
	g. overhead cost	"	"
	h. profits	"	"
	i. fabrication of gig and fixtures time and cost	"	"
	7. Do all location and ordering of materials.	"	"
	8. Lay out, cut out and assemble the project utilizing necessary gigs and fixtures.	"	"
250	At the completion of this course, each student will be able to utilize draftings, estimates and materials to construct two products.	T	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
WELDING SYMBOLS	Each student will be able to the instructor's satisfaction, identify: interrupt, reference line, arrow, all welding symbols, dimensions and other data, supplementary symbols, finish symbols, tail, other specifications, A.W.S. Letter Designations.	I	S-PS
	At the completion of this course each student will be able to identify to the instructor's satisfaction, all welding symbols, and data that has to do with: measurement, finish, other specifications, and A.W.S. Letter Designations.	T	S-PS
BRAZE, FERROUS	Each student will be able to: 1. Set up and perform oxy-fuel braze on cast iron, steel, castings. 2. Braze a lapp joint with 100% penetration. 3. Using stringers, build up a minimum 2" X #" pad with 16 G.A.M.S.P. or 1/8" M.S.P.	I	S-PS
	At the completion of this course, each student will be able to utilize oxy-fuel brazing equipment to repair cast iron, steel castings.	T	S-PS
BRAZE, NON-FERROUS	Each student will be able to: set-up and perform brazing on aluminum, stainless steel, and unlike metals together, and be able to select the appropriate alloy to accomplish the task.	I	S-PS
	At the completion of this course, each student will be able to set-up brazing equipment, braze non-ferrous metals, aluminum, stainless steel, and different alloys together, and be able to pick right brazing alloy to the instructor's satisfaction.	T	S-PS

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HARDSURFACING	Each student will be able to use oxy-fuel or arc welding equipment to hardsurface mild steel. Be able to pick right hardsurfacing alloy for a particular job.	I	S-PS
	At the completion of this course, each student will be able to: use oxy-fuel equipment and arc welding equipment to hardsurface mild steel, and be able to pick the right hardsurfacing alloy for a particular job, to the instructor's satisfaction.	T	S-PS
GAS WELDING	Each student will be able to state to the instructor's satisfaction:	I	S-PS
	I. History of Gas Welding Processes	"	"
	1. When, where, why, how, of gas welding	"	"
	II. How Gases Are Produced.	"	"
	1. The make-up of:	"	"
	a. Acetylene	"	"
	b. Oxygen	"	"
	c. Mapp	"	"
	d. Propane	"	"
	e. Natural Gas	"	"
	f. Hydrogen	"	"
	2. Why one gas is used over another.	"	"
	3. What elements are used to produce a particular gas.	"	"
	4. What element or elements are used to neutralize a gas or improve it.	"	"
	III Capacity of Cylinders in C.F.D.'s:	"	"
	1. Understand what cubic feet means to cylinder identification.	"	"
	2. Visual size of cylinders	"	"
	IV. Methods of Distributing Gas:	"	"
	1. Transportation	"	"
	2. Form (liquid or gas)	"	"
	3. How liquid is changed to a gas	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
GAS WELDING (cont'd)	V. Designs of Valve Mechanisms, Manifolds, and Pressure Regulators:	I	S-PS
	1. Construction of valves	"	"
	2. Use of valves	"	"
	3. Construction of manifolds systems dealing with gas welding.	"	"
	4. Safety devices used with valves, manifolds, pressure regulators,	"	"
	5. Construction of pressure regulators	"	"
	6. Use of single stage, double stage	"	"
	7. Care and handling of regulators	"	"
	VI Composition and Use of Filler Rods:	I	S-PS
	1. Composition of gas welding rod	"	"
	2. Use of gas welding	"	"
	3. What elements used in gas welding rods	"	"
	4. The A.W.S. Classification for steel gas welding rods	"	"
	5. The effect of oxygen or fuel gas on molten metal	"	"
	At the completion of instruction on gas welding, the student will be able to state to the instructor's satisfaction: the history of gas welding processes, how gases are produced; the capacity of cylinders in C.F.D.'s; the methods of distributing gases; the designs of valve mechanisms, manifolds, and pressure regulators; and the composition and use of filler rods.	T	S-PS
OXY-FUEL CUT STEEL	Each student will be able to:	I	S-PS
	1. Safely set up and light a cutting torch	"	"
	2. Cut the following keeping the kerf within ± 1/32" and ± 5°:	"	"
	a. 1/8" through 3/8" M.S.P.	"	"
	b. square and round stock	"	"
	c. angle and channel bar	"	"
	d. 1/2" diameter holes in a 1/4" or 3/8" plate.	"	"
250	Each student will be able to utilize the "track burner" to cut bevels in 3/8" mild steel plate. The bevel face will have uniform width and no visual defects.	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
OXY-FUEL CUT STEEL	Each student will be able to do the following cuts:		
	a. ½" mild steel plat 12" without guide with no slag within 1/8" + of a straight line and 2° ± of square	I	S-PS
	b. 3/8" mild steel plate 12" without guide with no slag within ± 1/8" of a straight line and ± 2° of square	"	"
	c. 3/8" mild steel plate 12" vertical vee groove to be welded	"	"
	d. 3/8" mild steel plate 12" overhead vee groove to be welded	"	"
	Each student will be able to:		
	1. Set up, ignite, and extinguish the flame, and dismantle an oxy-fuel track burner in a safe and usable sequence	I	S-PS
	2. Do the following cuts:	"	"
	a. ½" mild steel plate 12" with no slag	"	"
	b. 3/8" mild steel plate 12" with no slag.	"	"
	At the completion of this course the student will be able to utilize oxy-fuel cutting equipment to cut mild steel 4" thick, ½" through 3/8" in any position manually to the instructor's satisfaction.	T	S-PS
ARC CUTTING	Each student will be able to set up the following Air Carbon-ARC Cutting Carbon ARC Cutting, Metal ARC Cutting equipment to be able to cut non-ferrous and ferrous metals.	I	S-PS
	At the completion of this course each student will be able to set up Air Carbon-ARC Cutting, Carbon ARC Cutting, Metal ARC Cutting equipment to the instructor's satisfaction.	T	S-PS
SHIELDED METAL ARC WELDING	Each student will be able to state to the instructor's satisfaction the operating characteristic or requirement as defined for the following:	I	S-PS
	I. S.M.A.W. Welding Power Sources	"	"

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
SHIELDED METAL ARC WELDING (cont'd)	1. Motor-generators	I	S-PS
	a. D.C. current		
	b. A.C. current		
	c. Combination A.C., D.C.		
	d. Where used		
	2. Transformer-rectifiers	I	S-PS
	a. Operation of the machine		
	b. The operation of a rectifier		
	c. Usage		
	3. A.C. Transformer	I	S-PS
	a. The operation of a transformer	I	S-PS
	b. Usage	I	S-PS
	II. S.M.A.W. Multiple-operator Power Systems	I	S-PS
	1. Where, how used	I	S-PS
	2. Set-up and operation	I	S-PS
	III. Power Supply Ratings	I	S-PS
	1. Current output	I	S-PS
	2. Open circuit voltage	I	S-PS
	3. Duty cycle	I	S-PS
	4. Efficiency	I	S-PS
	5. Power factor	I	S-PS
	IV. Cables and Fasteners	I	S-PS
	1. Electrode holder and ground cable	I	S-PS
	a. Type of metal		
	2. Cable, lugs and ground clamps	I	S-PS
	a. Type of metal		
	b. Type of covering		
	3. Repair of cable, electrode holder, ground clamp	I	S-PS
	4. The use of different connections in S.M.A.W.	I	S-PS
	V. Equipment Needed To Operate a S.M.A.W. Process	I	S-PS
	1. Use of current	I	S-PS
	a. A.C.		

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CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
SHIELD METAL ARC WELDING (cont'd)	b. D.C.S.P. c. D.C.R.P. 2. Hand tools a. Chipping hammer, wire brush, pliers b. Ball peen hammer, cold chisel 3. S.M.A.W. helmet a. Lens shade (1-12) b. Clear lens c. Different shapes for different uses 4. Electrode holder and ground clamp 5. Hazards related to S.M.A.W. 6. Electrodes VI. Types, Coverings, Composition, Selection, Operating Characteristics of S.M.A.W. Electrodes 1. Metal Arc welding electrode 2. Bare (lightly coated) electrodes 3. Covered (shielded arc) electrodes 4. Comparison of bare and covered electrodes 5. Composition of S.M.A.W. electrode wire 6. Composition of S.M.A.W. electrode covering a. Fluxes b. Deoxidizers c. Slagging ingredients d. Alloying ingredients e. Gas reducers f. Binders g. Arc stabilizers 7. Selection of electrode a. Type of steel b. Welding conditions c. Applications	I I I I I I I I I I I I I	S-PS S-PS S-PS S-PS S-PS S-PS S-PS S-PS S-PS S-PS S-PS S-PS

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CLUSTER_____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
SHIELD METAL ARC WELDING (cont'd)	8. Operating Characteristics of S.M.A.W. Electrodes a. Weather b. Operating S.M.A.W. electrodes that have been wet c. What the magnetic field does to the arc	I	S-PS
	9. A.W.S. Classification a. What the letter stands for and the numbers stand for	I	S-PS
	At the completion of this course the student will be able to state to the instructor's satisfaction: S.M.A.W. Welding Power Sources, S.M.A.W. Multiple-operator Power Systems, Power Supply Ratings, Cables and Fasteners, Equipment needed to operate a S.M.A.W. Process, Types, Coverings, Composition, Selection, Operating Characteristics of S.M.A.W. Electrodes, A.W.S. Letter designation of S.M.A.W. Electrodes.	T	S-PS
T.I.G.	Each student will be able to: 1. Set up, adjust current and gas flow for each metal to be welded using each of the following machines a. Miller b. Lincoln c. A.O. Smith d. Hobart 2. Do the following welds having uniform width, reinforcement and no visual defects a. Stringer without rod, stringer with rod, butt, lapp, tee and outside corner in 6" of 16 gauge mild steel in the flat and vertical positions b. Stringer without rod,stringer with rod, butt, lapp, tee and and outside corner in 6" of 16 gauge aluminum in the flat and vertical positions c. Stringer without rod, stringer with rod,butt, lapp, tee and outside corner in 6" of 16 gauge stainless steel in the flat and vertical positions	I	S-PS

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
T.I.G. (cont'd)	d. Prepared joint 6" long and 1/4" to 3/8" thick in mild steel, aluminum, stainless steel and 3" standard pipe, magnesium. Each student will be able to utilize a T.I.G. welder to weld aluminum, magnesium, stainless steel and mild steel in all positions.	T	S-PS
M.I.G.	Each student will be able to: 1. Set up, adjust current and gas flow for short arc and spray arc 2. Do the following short arc welds having uniform width, reinforcement and no visual defects: a. Stringer, butt, lapp, tee and outside corner in 12" of 16 gauge mild steel 3. Do the following spray arc welds having uniform width, reinforcement and no visual defects: a. Stringer, butt lapp, tee and outside corner in 12" of 1/4" mild steel 4. Do the following welds having uniform width, reinforcement and no visual defects: a. Butt, lapp and tee in 6" of 16 gauge aluminum b. Butt weld prepared 3" standard pipe c. Prepared butt in 3/8" mild steel 12" long d. Prepared butt in 3/8" mild steel with an open root from 1/8" to 1/2" in 12"	I	S-PS
	Each student will be able to utilize a M.I.G. welder to weld mild steel and aluminum in all positions with short arc, and be able to use spray arc	T	S-PS
PIPE	At the completion of this course, each student will be able to: 1. Weld in the horizontal position, a butt joint with a 30° bevel on both pieces with 100% penetration 75% of the joint. This joint can be rolled. 3/4" pipe Sec-40	I	S-PS

CURRICULUM ARTICULATION

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
PIPE (cont'd)	2. Weld in the vertical fixed position, the pipe cannot be rolled. A butt joint from 3'4" pipe sec-40 with a 30° bevel on both pieces, with 100% penetration 75% of the joint 3. Weld in a 45° fixed position, cannot be rolled. A butt joint from 3/4" pipe sec-40 with a 30° bevel on both pieces with 100% penetration 75% of the joint 4. Weld in the horizontal position, a butt joint from 1/2" tubing, can be rolled, with 100% penetration 75% of the joint. At the completion of this course, each student will be able to: 1. Set up a pipe beveling machine to cut 3" or 4" of sec-40 pipe. The student has to have the teacher watch this set up. 2. Using the pipe beveling machine, make a 90° cut to 3" or 4" of sec-40 pipe, the cut has to be square, the end of the pipe has to be square. 3. Using the pipe beveling machine, make a 30° cut from the vertical position on 3" or 4" sec-40 pipe. The cut and end of the pipe has to be on the "money". Before the cut is made, the student has to measure the piece of pipe, with the measure that is taken. The student will then cut 1/2" off, after the cut is made the piece of pipe should be 1/2" shorter. This length can be within 1/16". 4. Using the oxy-fuel cutting torch, the student will make a hand cut on 3" or 4" sec-40 pipe. The angle of the cut will be 90° ± 5°. The end of the pipe will be within 3/32" of square. The student will use a wraparound to get his line. 5. Using the oxy-fuel cutting torch, the student will make a hand cut on 3" or 4" sec-40 pipe. The angle will be 30° ± 5°. The end of the pipe will be within 3/32" of square. The student will use a wrap-around to get his line. 6. Using the oxy-fuel cutting torch, the student will make a 4 piece 90° elbow from 3" or 4" pipe using the contour marker to fabricate his gore pattern. The finished elbow has to be within 10° of a 90°. The gore will have a 30° bevel.		

CURRICULUM ARTICULATION

CLUSTER _____

UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
PIPE (cont'd)	7. Using the oxy-fuel cutting torch, the student will make a 2 piece 45° elbow. The gore will have a 30° bevel. 8. Using the oxy-fuel cutting torch, the student will make a 2 piece 90° elbow with a 30° bevel 3" or 4" pipe, using the wraparound to get the angle. The finished fitting has to be within 5° of the 90°. 9. Using the oxy-fuel cutting torch, the student will make a fish mouth (tee joint) using 3" or 4" sec-40 pipe, with fish mouth having a 30° bevel. The student will also cut the hole in the pipe for the fish mouth. The fish mouth will fit on top of the pipe. The finished fitting will be within 5° of a 90°. 10. Using the oxy-fuel cutting torch, the student will make a concentric reducer from 3" of 4" sec-40 pipe, reducing the I.D. 1", the finished fitting will be within 1/16", the length should be or over 5". 11. Using the oxy-fuel cutting torch, the atudent will make a Y fitting from 3" or 4" sec-40 pipe. The fitting should branch off evenly.		
	At the completion of this course, each student will be able to: 1. Using the pipe that was cut in objective 2-3, cut another piece of pipe to match. Take the pipe and tack it together. Put it in the horizontal fixed position using E6010 or E6011, this joint will be done with uphand, with 100% penetration with 75% of the joint, the cover pass must be uniform in width, reinforcement and no visual defects. 2. Cut two pieces of pipe 3" or 4" sec-40 with a 30° bevel on both pieces, tack them together and put them in the vertical fixed position using E6012 or E6013, weld the joint up with 100% penetration 75% of the joint. Finished weld should be uniform in width, reinforcement and no visual defects. 3. Cut two pieces of pipe and follow objective 3-1 and weld the joint down hand. 4. Using the fitting, cut out in objective 2-6, the student will weld the fitting up with 100% penetration 75% of the joint with a uniform width	I	3-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
PIPE (cont'd)	and reinforcement and no visual defects. The student will pick the rod. 5. Using thefitting cut out in objective 2-7, the student will weld the fitting up with 100% penetration 75% of the joint with a uniform width and reinforcement and no visual defects. The student will pick the rod. 6. Using the fitting cut out in objective 2-8, the student will weld the fitting up with 100% penetration 75% of the joint. The first pass will be with E6010 or E6011, the rest of the passes will be done with E7018. The weld will have uniform width, reinforcement and no visual defects. 7. Using the fitting cut out in objective 2-9, the student will weld the fitting up with 100% penetration 50% of the joint. The finished weld will have uniform width, reinforcement and no visual defect. The student will pick his rod. 8. Using the fitting cut out in objective 2-10, the student will weld the fitting up having uniform width, reinforcement and no visual defects. The student will pick his own rod. 9. Weld the fitting up from objective 2-11 having uniform width, reinforcement, and no visual defects. The student will pick his own rod. 10. Weld the fitting up from objective 2-12, having uniform width, reinforcement and no visual defects. Student will use E6010 only. 11. Using two pieces of pipe (3" or 4" sec-40) with bevel ends (30°), the student will tack the pipe together and put the pipe in the fixed horizontal position, and put the first pass in with E6010 with 100% penetration. Grind out slag and fill rest of joint with E6010, this will be done down-hand. The weld should be uniform in width, reinforcement and no visual defects. 12. Using two pieces of pipe together, put it in the fixed horizontal position, put the first pass in with E6010 down hand with 100% penetration, grind out slag, fill the rest of the joint up with E7018 or E7016, using the up-hand technique.		
272	Each student will be able to utilize oxy-fuel equipment to weld 1/2" tubing and 3/4" pipe. Each student will be able to utilize oxy-fuel cutting equipment to cut 3"	T	S-PS 273

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
PIPE (cont'd)	and 4" sec-40 pipe on a 30° bevel, a square end cut and a number of fittings, 90° elbow, 45° elbow, Tee Joint, Bull Nose, Dead End Pile coupling, Y Joint Reducer.		
	Post Secondary students will also be able to set up and operate a pipe beveling machine.	T	PS
	Each student will be able to utilize arc welding equipment to weld up-hand and down-hand with 100% penetration 75% of the joint.	T	S-PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
STRENGTH OF MATERIALS	At the completion of this course, the student will be able to: estimate the strength of a welded unit, strengths of different structual shapes.	T	PS
"	Each student will understand how to estimate the strength of a weld and where it should be applied.	I	PS
"	Each student will understand the strength's of different structual shapes.	I	PS
METALS	At the completion of this course, the student will be able to: understand the classification of metals, the chemical make-up, where and how the metal would be used.	T	PS
"	Each student will understand steel making processes, aluminum production, stainless steel production.	I	PS
"	Each student will understand where, why metals should be used, the chemical make-up, SAE and AISI numbering system. AISI - American Iron and Steel Institute SAE - Society of Automotive Engineers	I	PS

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UNIT OR SKILL TITLE	PERFORMANCE OBJECTIVE	OBJECTIVE TYPE T = Terminal I = Interim	LEVEL S = Secondary PS = Post-Sec.
QUALIFICATION TESTING	At the completion of this course, each student will be able to: use equipment to perform a destructive test, and understand the equipment needed to perform a non-destructive test, and be able to visual inspect a weld-ment.	T	PS
"	Each student will be able to: I. Destructive testing 1. Preparing specimens 2. Perform guided bend and tensile tests 3. Evaluate test data	I	PS
	II. Non-destructive 1. Magnetic particle testing 2. Radiographic Inspection 3. Dye Penetrant inspection 4. Flourescent Penetrant inspection 5. Ultrasonic inspection	I	PS
"	III. Visual Inspection 1. Be able to determine by visual inspection if a weld has any defects on the surface	I	PS

PROGRAM: WELDING

PREPARED BY: MEL CIULLA - EDWARD LANGLOIS

SCHOOL: N.H.V.T.C. - MANCHESTER - BERLIN HIGH SCHOOL

	OCCUPATIONAL / TITLES	O.E. No.	D.O.T. No.	UNIT OR SKILL TITLE: Shop Safety/Orientation	Identify & Use Tools	Set Up Equipment	Scales & Measurements	Definitions	Abbreviations	Blue Print	Fabricate	Welding Symbols	Brazing Symbols	Brazing Ferrous Metals	Brazing Non-Ferrous Metals	Hardfacing	Gas Welding	Oxy-Fuel Cutting - Steel	ARC Gouging	Shielded Metal ARC Welding	T.I.G. (G.T.A.W.)	M.I.G. (G.M.A.W.)	Plate	Strength of Materials	Metals	Qualification Testing
SECONDARY	Welder Spot I	17.2306	810.782	R	R	R	R	R	R	R	C	C	C	C	C	C	C	C	C	O	O	O	O			
	Welder Apprentice ARC		810.884	R	R	R	R	R	C	C	C	C	C	C	C	R	R	C	C	O	O	O	O			
	Welder Tack	17.2306	810.884	R	R	R	R	R	R	R	R	C	C	C	C	R	R	C	C	O	O	O	O			
	Welder Helper		810.887	R	R	R	R	R	C	C	O	O	C	C	C	O	R	O	R	C	C	O	O	O	O	
	Welder ARC	17.2306	810.884	R	R	R	R	R	R	R	C	O	O	R	R	R	R	R	R	R	O	R	O			
	Welder Gas		811.884	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	O	O	R	O	K	O
	Welder Apprentice Comb.	17.2306	812.884	R	R	R	R	R	O	R	O	C	R	O	O	R	R	O	R	O	O	O	O	O	K	O
	Welder ARC Cutter	17.2306	816.884	R	R	R	R	R	R	R	R	C	C	O	O	R	R	C	C	O	O	O	O			
	Welder Combination	17.2306	812.884	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	K	O	
	Welder Repair	17.2306	812.884	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	O	
	Welder Fitter	17.2306	819.381	R	R	R	R	R	R	R	R	R	O	C	R	R	R	R	R	R	R	O	O	O		
	Brazing, Repair, Salvage	17.2306	814.884	R	R	R	C	R	O	R	R	R	R	R	R	O	O	O	R	O	O	O				
ARTICULATED	Welder ARC	17.2306	810.884	R	R	R	R	R	R	R	R	C	R	O	R	R	R	R	R	R	R	F	R			
	Welder Combination	17.2306	812.884	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	Welder Repair	17.2306	812.884	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O			
	Welder Fitter	17.2306	819.381	R	R	R	R	R	R	R	R	O	O	R	R	R	R	R	R	R	O	O	O			
	Laborer, Grinder, Polish	17.2399	705.887	R	R	C	R	R	O	O	O	C	O	C	O	C	O	C	O	C	O	O	O			
	Metal Fab. Shop Helper	17.2304	804.886	R	R	R	R	R	O	C	C	O	C	O	C	O	R	O	R	O	O	O	O			
	Welder, Tack	17.2306	810.884	R	R	R	E	R	R	R	R	E	O	O	O	E	O	R	O	O	O	O	O			
	ARC Cutter	17.2306	816.884	R	R	R	R	R	R	R	C	O	O	O	O	O	R	O	O	O	O	R	O			
	Flame Cutter Hand I	17.2306	816.884	R	R	R	R	R	R	R	C	O	C	O	C	O	R	O	O	O	O	O	O			
	Welder Production Line	17.2306	812.884	R	R	R	E	R	O	R	C	O	R	C	O	R	O	O	R	C	O	O	O			
	Welder Apprent. Comb.	17.2306	812.884	R	R	R	E	R	O	C	O	C	O	C	O	C	R	O	C	O	O	O	O			
	Brazing, Repair, Salvage	17.2306	814.884	R	R	R	R	R	C	C	O	R	R	R	C	O	O	C	O	O	O	O				
POST SECONDARY	Laborer, Grinder, Polish	17.2399	705.887	R	R	C	R	R	O	O	O	C	O	C	O	C	O	C	O	C	O	O	O			
	Metal Fab. Shop Helper	17.2304	804.886	R	R	R	R	R	O	O	C	O	C	O	R	O	R	O	O	C	O	O	O			
	Welder, Tack	17.2306	810.884	R	R	R	R	R	R	R	R	O	C	C	O	R	O	R	O	O	O	O	O			
	ARC Cutter	17.2306	816.884	R	R	R	R	R	R	R	C	O	O	O	O	C	O	C	O	C	O	R	O			
	Flame Cutter Hand I	17.2306	816.884	R	R	R	R	R	R	R	C	C	C	O	R	O	C	O	C	O	O	O	O			
	Brazing, Repair, Salvage	17.2306	814.884	R	R	R	R	R	C	C	C	R	R	R	C	O	O	C	C	O	O	O	O			
	Welder Apprent. Comb.	17.2306	812.884	R	R	R	R	R	O	C	C	O	C	O	R	O	R	O	C	O	O	O	O			
	Welder Production Line	17.2306	812.884	R	R	R	E	R	O	R	C	R	C	O	R	O	O	R	O	C	O	O	O			
	Flame Cutter Mac. OP.	17.2306	816.782	R	R	R	R	R	R	R	O	C	O	C	O	C	O	C	O	C	O	R	R			
	Welder, Mach. OP ATC	17.2306	810.782	R	R	R	E	R	R	O	O	O	C	O	O	O	O	R	R	R	R	R	R			
	Welder ARC	17.2306	810.884	R	R	R	R	R	R	O	R	O	C	C	R	O	R	O	R	R	R	R	R			
	Welder Combination	17.2306	812.884	R	R	R	R	R	R	O	R	R	R	R	R	O	R	R	R	R	R	R	R			
	Welder Fitter	17.2306	819.381	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O			
	Welder Repair	17.2306	812.884	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O			

CODE:
R = REQUIRED
O = OPTIONAL